Dissertation on

"ASSESSMENT OF CLINICAL CORRELATION BETWEEN BODY MASS INDEX AND SEVERITY OF BRONCHIAL ASTHMA"

submitted to

THE TAMIL NADU DR. M.G.R. MEDICAL UNIVERSITY

In partial fulfillment of the regulations

for the award of the degree of

M.D. GENERAL MEDICINE (BRANCH – I)

INSTITUTE OF INTERNAL MEDICINE

MADRAS MEDICAL COLLEGE

CHENNAI 600 003

THE TAMIL NADU DR. M.G.R. MEDICAL UNIVERSITY

CHENNAI

APRIL 2014

CERTIFICATE

This is to certify that the dissertation titled **"ASSESSMENT OF CLINICAL CORRELATION BETWEEN BODY MASS INDEX AND SEVERITY OF BRONCHIAL ASTHMA"** is the bonafide original work of **Dr. P. RAJA** in partial fulfillment of the requirements for M.D. General Medicine (Branch – I) Examination of the Tamilnadu DR. M.G.R Medical University to be held in APRIL 2014. The Period of study was from June 2013 to November 2013.

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DECLARATION

I, **Dr. P. RAJA** solemnly declare that dissertation titled **"ASSESSMENT OF CLINICAL CORRELATION BETWEEN BODY MASS INDEX AND SEVERITY OF BRONCHIAL ASTHMA"** is a bonafide work done by me at Madras Medical College and Rajiv Gandhi Government General Hospital, Chennai-3 during June 2013 to November 2013 under the guidance and supervision of my unit chief **Prof. Dr. K. SIVASUBRAMANIAN, M.D.,** Director and Professor of Medicine, Madras Medical College and Rajiv Gandhi Government General Hospital, Chennai.

This dissertation is submitted to Tamilnadu Dr. M.G.R Medical University, towards partial fulfillment of requirement for the award of degree of **M.D. General Medicine (Branch – I) – April 2014.**

Place : Chennai **(Dr. P. RAJA)**

Date :

ACKNOWLEDGEMENT

I owe my thanks to the Dean, Madras Medical College and Rajiv Gandhi Government General Hospital, Chennai-3 **Dr. V.KANAGASABAI, M.D., MBA** for allowing me to avail the facilities needed for my dissertation work.

I am grateful to beloved mentor **Prof. Dr.K.SIVASUBRAMANIAN, M.D.,** Director and Professor, Institute of Internal Medicine, Madras Medical College and Rajiv Gandhi Government General Hospital, Chennai for permitting me to do the study and for his encouragement.

I am extremely thankful to **Prof. Dr. D. RANGANATHAN, M.D,** Professor of Thoracic Medicine, Madras Medical College and Rajiv Gandhi Government General Hospital, Chennai for his valuable guidance and support.

I am extremely thankful to my Assistant Professors **Dr. M. ANUSUYA, M.D.,** and **Dr. D.K. SIVAKUMAR, M.D.,** for their guidance and encouragement.

I am also thankful to all my unit colleagues for their full cooperation in this study and my sincere thanks to all the patients and their families who co-operated for this study.

CONTENTS

LIST OF ABBREVIATIONS

GINA	-	Global initiative for asthma
BMI	-	Body mass index
ATS	-	American Thoracic Society
NIH	-	National Institute of Health
AHR	-	Airway hyper responsiveness
WHO	-	World Health Organization
FEV1	-	Forced expiratory volume in 1 second
PEFR	-	Peak expiratory flow rate
FVC	-	Forced vital capacity
ERS	-	European respiratory society
GERD	-	Gastroesophageal reflux disease
RSV	-	Respiratory syncytial virus
LCD	-	Low calorie diet
CVD	-	Cardiovascular disease
DALYs	-	Disability adjusted life years
TNF	-	Tumour necrosis factor
IL	-	Interleukin
CRP	-	C-reactive protein

"ASSESSMENT OF CLINICAL CORRELATION BETWEEN BODY MASS INDEX AND SEVERITY OF BRONCHIAL ASTHMA"

ABSTRACT:

AIMS & OBJECTIVES:

To study the risk of Bronchial asthma severity with increasing body mass index. To study the significance between C- reactive protein and obesity. To assess the morbidity of bronchial asthma patients with increasing weight.

METHODS:

We studied the association of body mass index (obesity) and severity of asthma in Rajiv Gandhi Government General Hospital, Chennai. We included known asthmatic adults, who were confirmed with reversibility spirometry test, between 20-40 years of age. A total of 100 patients were divided in to the following BMI classes according to Indian population standard. 61 normal (BMI class I – 18.5 to 22.9), 10 overweight (BMI class II – 23 to 24.9) and 29 obese patients (BMI class III $\geq$ 25). Based on Global initiative for Asthma (GINA) severity classification, patients were divided in to 4 categories, 17 patients in Class

I – mild intermittent asthma, 39 in Class II – mild persistent asthma, 24 in Class III – moderate persistent asthma and 20 in Class IV – severe persistent asthma. Patients were assessed by history, pulmonary function tests (FVC, FEV1, FEV1/FVC ratio, PEFR) and SpO2. C-reactive protein was done to assess the correlation with body mass index.

RESULTS:

Compared with normal weight asthmatic patients obese individuals were most likely to have missed working days, life threatening events, low SpO2, low FEV1/FVC ratio and high C-reactive protein. They were more likely to have severe persistent asthma than non-obese individuals.

CONCLUSION:

In our study, obesity has significant association with severity of asthma. It increases the burden to life very much. So in treatment plan of obese asthmatics, weight reduction strategy must be included with other measures.

KEY WORDS:

Body mass index, Pulmonary function tests, C-reactive protein.

INTRODUCTION

Bronchial asthma is defined by GINA[1] as a “chronic inflammatory disorder of airways, in which cell and cellular elements play a major role. This chronic inflammation leads to airway hyper responsiveness that cause recurrent wheezing, breathlessness, chest tightening and coughing particularly at night or in the early morning. These episodes will be usually associated with wide spread, but may be variable, airflow obstruction within the lung and is often reversible either spontaneously or with the treatment”.

Many trigger factors and co morbid conditions that will increase asthma symptoms and precipitate asthma exacerbations are obesity, gastro esophageal reflex disease, corticosteroid insensitivity, aspirin sensitivity, sinusitis, environmental exposure and genetics[2,3,4].

Asthma and obesity are major public health problem in India. Both conditions are more prevalent nowadays. Many literatures correlate these conditions. Many recent studies show that obesity is a main contributing factor for asthma and also explains a significant relationship between BMI and development of asthma. Some literatures have even explained that weight gain

provokes the asthma symptoms and similarly weight loss improves the symptoms.

Many theories explain the association between obesity and asthma. Already we know that obesity causes reduction in pulmonary compliance, diameter of terminal airway mainly located in the periphery, lung volumes, lung blood volume and also ventilation-perfusion relationship.

Recent theories explained that the increase in adipocytes in obese individuals can cause systemic pro-inflammatory state. Fat cells raise the serum level of many cytokines, chemokines and soluble fractions of their receptors.

Adipose tissue secretes and also synthesizes many factors which are called adipokines. They include

- Interleukin-10
- Interleukin-6
- Tumour necrosis factor-α
- TGF-β1
- Eotoxin
- C-reactive protein
- Leptin and adiponectin.

Further more bronchial asthma and obesity both have related specific human genome. The normal pattern of growth of the body and the tone of airways are altered by diet and genes.

The response of treatment to asthmatic patient is affected by obesity. Peters-Golden et al, analyses the treatment response to asthmatic patients with BMI by placebo, inhalational corticosteroids and antagonist to leukotriene receptor. In this study,

- The placebo received patients had greater under control of asthma in normal weight patients than overweight and obese patients.

- In patients receiving inhaled corticosteroids (beclomethasone) there was no changes in drug efficacy with weight.

- In patients receiving leukotriene receptor antagonists (monteleukast), clinical benefit was greater in high BMI (obese) patients than thin individual, which revealed that in obese patients, leukotriene are important mediators of symptoms.

The first and foremost object of this study is that weight control program should be included in obese asthmatic management and also the normal response of asthmatic treatment may be disturbed by obesity

AIMS AND OBJECTIVES

- To study the risk of Bronchial asthma severity with increasing body mass index.

- To study the significance between C- reactive protein and obesity.

- To assess the morbidity of bronchial asthma patients with increasing weight

REVIEW OF LITERATURE

OBESITY

Obesity is defined as abnormal accumulation of fat in the form of adipose tissue in various parts of the body which may cause many health problems. However, the site of distribution of fat is very important than the amount of fat. So excess abdominal fat is a major risk factor for many diseases.

PREVALENCE:

According to the NHANES data, in the American adult population, obesity may raise from 14.5% to 30.5%. In this data, >20years of age are more obese. Extreme obesity is increased to 4.7% of people. Obesity is increased in women and poor population. Recently prevalence of obesity is high in paediatric population.

[5]In 1960s, the prevalence of obesity was 11% in men and 16% in women. By NHANES II and NHANES III study, between 1976 and 1980, 1988 and 1994, the prevalence of obesity was 25% in men and 26% in wome. [5]During 2003-2004, the prevalence of obesity increased to 32% in men and 34%

in women. In short period of time from 1999 to 2004, the rate of prevalence of obesity significantly increased.

EPIDEMIOLOGICAL OBSERVATIONS:

1. CROSS SECTIONAL STUDIES:

Several studies revealed that increased incidence of bronchial asthma is seen in obese patients. All the studies have significant data and large number of patients. Data taken for BMI estimation like height and weight was self reported. In Some studies, asthma was diagnosed and classified according to clinical history and previous diagnosis. It explained that, even the asthma and obesity related with other problem like sleep apnoea and GERD, the association between high BMI and asthma increased significantly[6,7,8].

2. PROSPECTIVE STUDIES:

Many studies showed that the obesity is a major risk factor for the asthma, and increases risk from 1.1 times to 3 times[9,10,11]. In another study, more individuals were included and longer time followed up for longer time. This showed increased incidence of development of asthma around 10% in men and 7% in women per unit increase in Body

Mass Index. In conclusion, the study showed positive correlation between the BMI and increasing asthma. So we can conclude that the increase in weight paves place for developing asthma

3. STUDIES IN PEDIATRIC POPULATIONS

Many studies were conducted in pediatric populations to assess the strength of results and direction of relation between asthma and obesity which shows that they are heterogeneous. One study[12], conducted in 9828 children between 6 to 14 years of age. It revealed the significance of obesity in increasing the risk of asthma, particularly in girls. Another study[13], conducted in the same time in 3795 children showed that the risk of asthma increased, when person became overweight and obese, which is particularly more in boys than in girls.

A study conducted in 4720 persons born in the year of 1996 by Finnish et al[14], revealed that increasing weight in early life, increases the risk of asthma in adult life. In most recent studies[15] conducted in 4393 children, who had no symptom of asthma in first two years of life, were followed up to 14 years, the observation showed that the group of individual with high BMI had 2.5 fold increased risk for developing bronchial asthma when compared with low BMI individuals. In children

participating NHANES III, the association was found mainly between BMI and bronchial asthma, but not with atopy.

4. STUDIES INCLUDING WEIGHT CHANGES:

The Nurse Health study[9] showed that the involved persons who increased weight greater than 25 kg from the 18 years of age, the probability for development of asthma rose 4.7 times than those whose weight remained stable. Weight loss by surgery improved the patient symptomatically and good treatment response and reduced duration of hospital admission[16]. Weight loss achieved by diet will improve the lung function in obese asthmatics. 15% reduction in body weight may lead to better results in FEV1, FVC, lower symptom scores and decrease frequency of medication use.

HYPOTHESIS FOR ASSOCIATIONOF ASTHMA AND OBESITY

PHYSIOLOGICAL CHANGES IN OBESITY:

Weight gain (obesity) can reduce the pulmonary compliance, lung volume, volume of blood in lungs, diameter of airways which are located in periphery and ventilation-perfusion relation. In obese patients, more deposition of fat can compress and infiltrate the thorax and thereby can causes reduction of pulmonary compliance. All the above factors can increase the symptom of

dyspnoea[17]. The obesity can produce limitation of the airflow with reduction in FEV1 and FVC. This leads to symmetrical reduction in FEV1 and FVC, so the ratio between these remains the same. Sometimes this ratio may be like restrictive models[18] in overweight individuals. This change in lung physiology in obese individuals can cause superficial respiration with reduction of lung volume like expiratory reserve volume. This lung volume reduction is associated with peripheral airway diameter reduction, which produces change in the smooth muscles of airways that increase the obstruction and bronchial hyper reactivity[19].

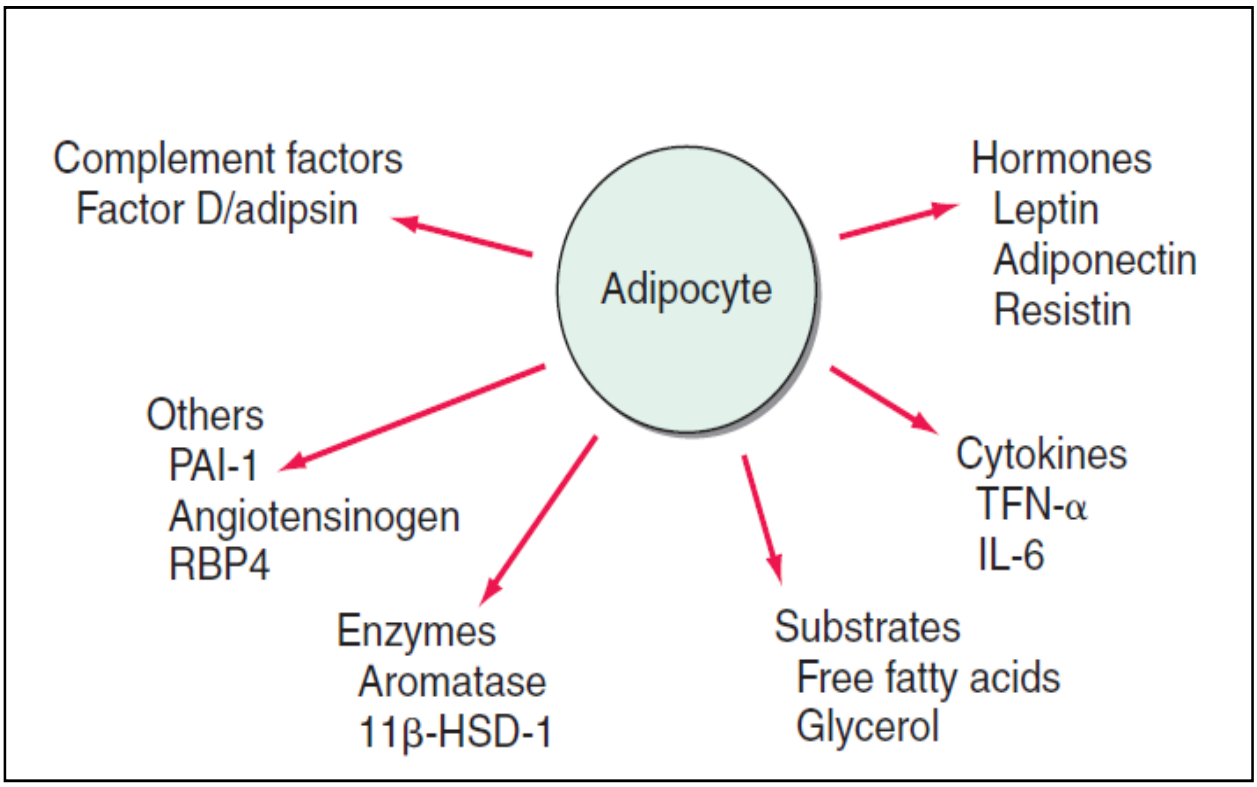
OBESITY AND INFLAMMATORY MEDIATORS:

Recent theory explained that the increased adipocytes in obese individuals can cause systemic pro-inflammatory state. Fat cells raise the serum level of many cytokines, chemokines[20] and soluble fractions of their receptors.

Adipose tissue secretes and also synthesizes many factors which are called adipokines. They include

- Interleukin-6 & 10
- Tumour necrosis factor-α
- TGF-β1
- Eotoxin
- CRP

- Leptin and adiponectin



TUMOR NEROSING FACTOR -α:

TNF-α is produced in adipocytes. It is elevated in asthma patients. It produces TH2 cytokines of IL-4, IL-6 in the epithelium of bronchial airways. High TNF-α level leads to release of higher amount of cytokines.

IL-6, IL-10:

Serum IL-6 level increased in obese Individuals. It is associated with risk of severe bronchial asthma[21]. In obese mice, treated with anti IL-6, it was found that there was reduction in bronchial hyper reactivity. This result was not found in normal mice, which had the same treatment[22].

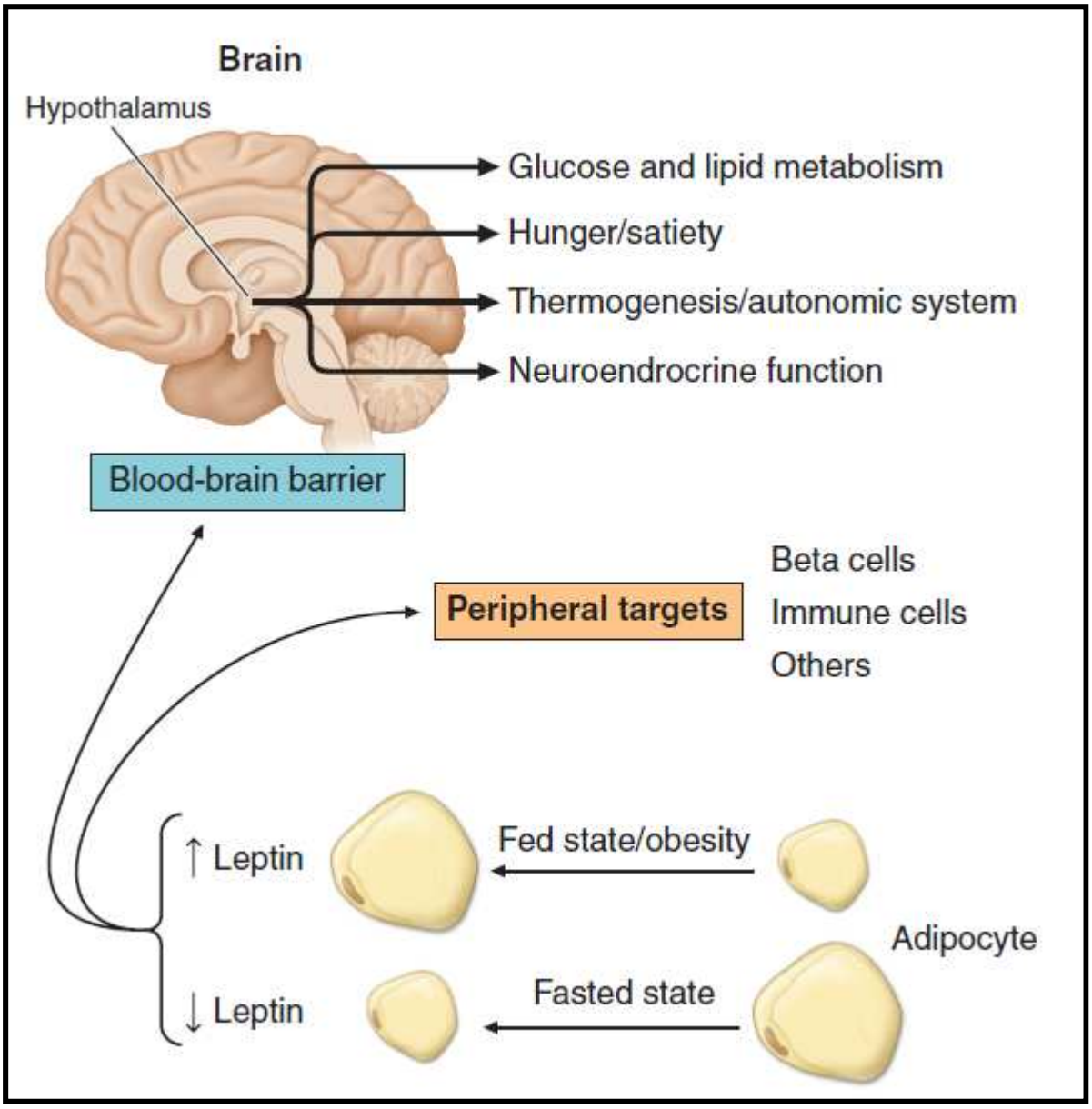
LEPTINS:

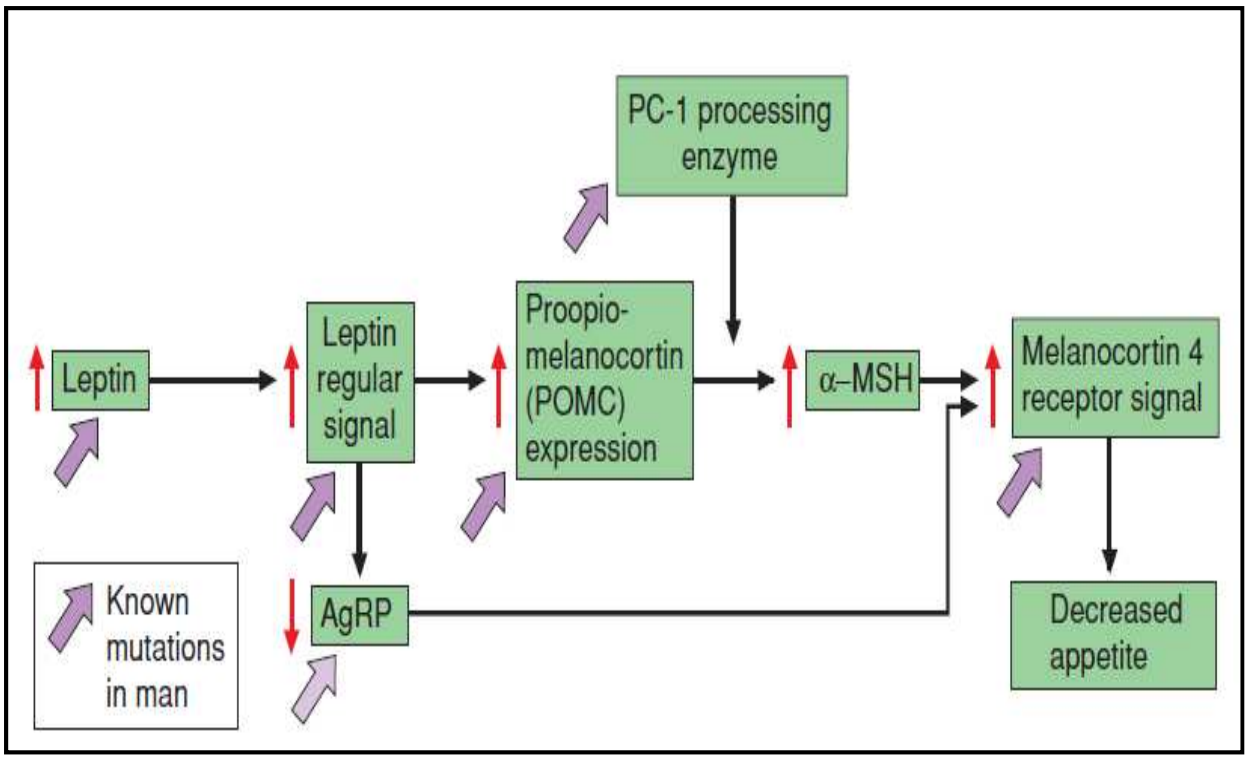
A lot of articles explain the role of leptin in relation between bronchial asthma and obesity. Leptin is a hormone. It is produced in adipocytes, as well as in hypothalamus, placenta and ovaries, which is elevated in obese individuals. Leptin acts as lipostat. When there is increase in fat storage in adipocytes, leptin is released in to the bloodstream. Increased leptin in blood sends the negative feedback signals to hypothalamus and releases more anorexigenic peptides and less orexigenic peptides.

"Leptin" plays a role in inflammation in obese individuals. It produces proliferation and activation of T-cells. It recruits the monocytes and macrophages and promotes angiogenesis.

"Leptin" has a role in the development of lung and critical mediator for differentiation between the lipofibroblast, fibroblast and also in the synthesis of lung surfactants[24]. In animal models, administration of leptin preparation exogenously will increases inflammation in lung[25] and also alters serum IgE levels. Leptins increase the bronchial hyper reactivity by allergens[26].

In humans, leptin level is most important factor to predict the development of asthma, particularly in children[27].





Central pathway – regulation of leptin to maintain the body weight and appetite

One study conducted in 5870 individuals of women with the asthma had an increased level of leptin than those without have asthma[28].

ADIPONECTIN:

Serum adiponectin levels are reduced in obese individuals. This hormone has important role in anti-inflammatory action in the airway epithelium[29]. Decreased level of adiponectin in asthmatic individuals can provoke the symptoms, which implies the role between obesity-asthma relationships.

EOTOXIN:

Systemic eotoxin increased in obese persons, which is synthesized in adipocytes, plays potential role in severity of asthma in obese individuals[30].

GENETIC FACTORS:

In human genome, specific regions are linked to obesity and bronchial asthma.

- chromosome 5q
- chromosome 6
- chromosome 11q13 and 12q[31]

- **Chromosome 5q**

Chromosome 5q codes for genes ADRB2 and NR3C1. The ADRB2 gene contains the regions for β2- adrenergic receptors which is important to maintain the tone of airway and baseline metabolism. NR3C1 gene – codes for glucocorticoid receptor, important for inflammatory response in obesity and asthma.

- **Chromosome 6:**

Chromosome 6 codes the genes for TNF-α, that is important for anti-inflammatory response and immune response in bronchial asthma and also in obesity.

- **Chromosome 11q13:**

Chromosome 11q13 has loci for proteins UCP2-UPC3. It also has loci for low affinity IgE receptor. The UCP2-UCP3 protein is important for baseline metabolism. The “low affinity IgE receptor” produces inflammatory response to TH2 cells. This level increases in asthma patients.

- **Chromosome 12q:**

Chromosome 12q contains loci for inflammatory cytokines for asthma, LTA4H, IFN-γ, nitric oxide synthase-1. It also contains

inflammatory mediators for obesity like CD36L1, STAT6, type I insulinoid growth factor

- β3 adrenergic receptors located in the adipose tissue which maintain the lipolysis and thermogenesis. Genetic mutation of the gene for β3adrenergic receptor has the capacity to increase weight[32].

HORMONAL FACTORS:

One longitudinal study was carried out and it showed that the effect of weight gain over bronchial asthma is greater in female than male. The enzyme aromatase converts androgens to estrogens. It is present in adipose tissue. The obese women produce increased level of oestrogen, which is related with the early menarche in female and delayed puberty in male[35, 36].

Tueson [37]cohort study revealed that the number of patients with asthma was very high in overweight females who attain menarche earlier than those attaining menarche at later stage. This suggests that obesity disrupts the hormone production in girls at puberty. This increased production of female

hormones has altered the lung development and airway tone in the girls of pubertal age.

DIET FACTORS:

Many diet related to the high number of asthma patients in adults and children. Vitamin C, Vitamin E, riboflavin, carotene, pyridoxine and minerals produce improvement in immune function and reducing the severity of asthma.

Romieu et al[38] explained that the women consuming vegetables, fruits and green-leaves have lower incidence of asthma. Trans-fatty acid containing food consumption in children is linked to reduced prevalence of asthma[39].

IMPLICATION FOR TREATMENT:

The response of treatment to asthmatic patient is affected by obesity. Peters-Golden et al[43], analyses the treatment response to asthmatic patients with obesity by placebo, inhalational corticosteroids and antagonist to leukotriene receptor. In this study,

- The placebo received patients had greater control of asthma in normal weight patients than overweight and obese patients.

- In patients receiving inhaled corticosteroids (beclomethasone) there was no changes in drug efficacy with weight.

- In patients receiving leukotriene receptor antagonists (monteleukast), clinical benefit was greater in high BMI (obese) patients than thin individual, which revealed that in obese patients, leukotrienes are important mediators of symptoms.

Another study conducted to compare the efficacy of placebo, theophylline and monteleukast to the overweight asthmatic patient. The patients treated with theophylline have worsening symptoms of asthma in obese than lean asthmatic patients. But symptoms improved with monteleukast in obese asthmatics.

COMPLICATIONS OF OBESITY:

Obesity and overweight is a second leading cause of death in US, more complication associated with greater intra abdominal fat accumulation than other parts. Life expectancy has shortened by 2-5 years in moderately obese. Patient with BMI > 45, particularly male, will loss 13 years of life. The following are the complications.

- Asthma
- Malignancy
- Coronary artery disease
- Dementia
- Depression
- Diabetes
- Impaired Fertility and reproduction
- Gastro-esophageal reflux disease
- Kidney disease
- Liver disease
- Increased mortality
- Osteoarthritis
- Pancreatitis
- Sleep disorders

MEASUREMENTS:

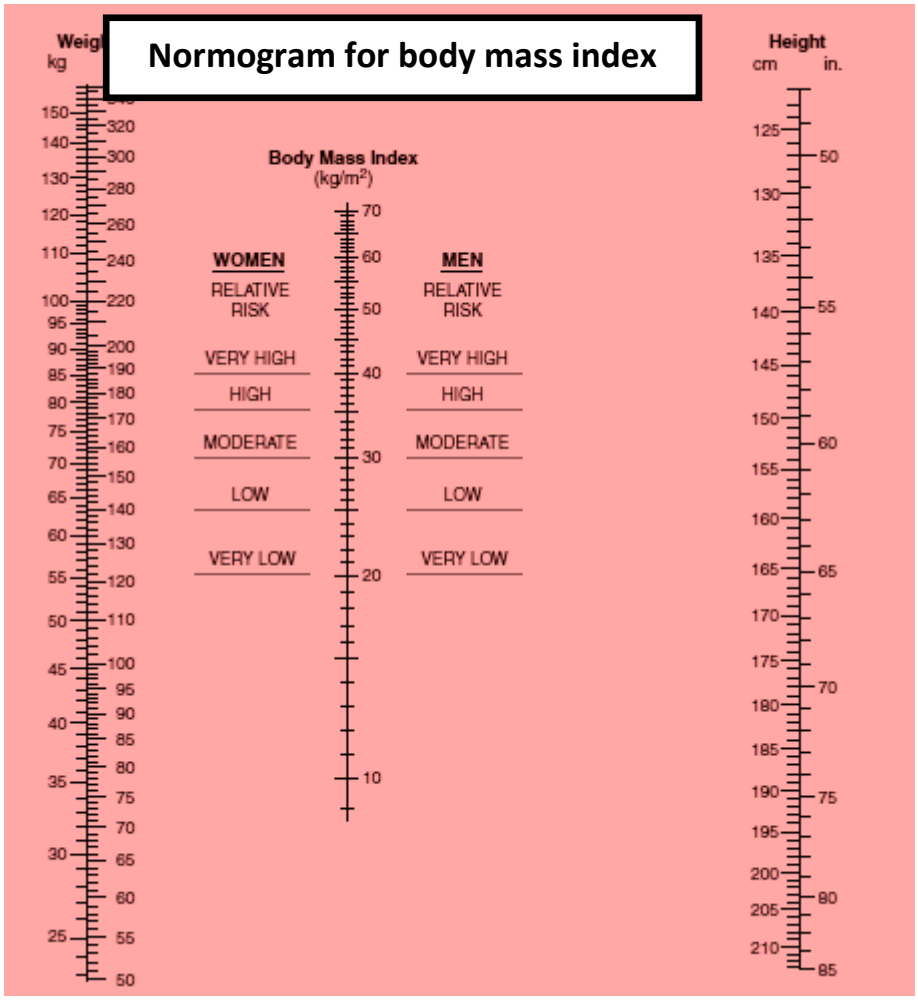
BODY MASS INDEX:

One of the commonly used indices. This is defined as body weight in kilogram (kg) divided by height (meters) squared.

BMI= WEIGHT (kg) / HEIGHT (meters)^2

WEIGHT STATUS CLASSIFICATION ACCORDING TO BMI

Classification	BMI (kg/m^2)	Risk of co-morbidities
Underweight	<18.5	Low
Normal weight	18.5 – 24.9	Average
Overweight: Pre obese	≥25 25 – 29.9	Increased
Obese class I	30.0 – 34.9	Moderate
Obese class II	35.0 – 39.9	Severe
Obese class III	≥40.0	Very severe


Normogram for body mass index
Weig
kg
Height
cm
in.
Body Mass Index
(kg/m²)
WOMEN
RELATIVE RISK
VERY HIGH
HIGH
MODERATE
LOW
VERY LOW
MEN
RELATIVE RISK
VERY HIGH
HIGH
MODERATE
LOW
VERY LOW

BMI FOR ASIAN POPULATIONS:

The classification of obesity in Asian population showed increased risk of co morbidities of obesity occur in lower BMI in Asian population

Classification	**BMI (Kg/m2)**	**Risk of Co-morbidities**
Underweight	<18.5	Low
Normal range	18.5 – 22.9	Average
Overweight	>23.0	
At risk	23.0 – 24.9	Increased
Obese class I	25.0 - 29.9	Moderate
Obese class II	>30	Severe

WAIST CIRCUMFERENCE AND WAIST-HIP RATIO:

Excess of abdominal fat is a predictor of risk factor and morbidity related to obesity like type II diabetes, systemic hypertension, dyslipidemia and ischemic heart disease. So waist circumference is one of the valuable additional methods to measure abdominal fat and identify the individual at increased risk. In Caucasians, the waist circumference of 94cm and above for men, 80cm and above for women has increased risk. In Asians 90cm and above for men, 80cm and above for women has increased risk.

CUT-OFF POINTS OF WAIST CIRCUMFERENCE FOR INCREASED RISK:

	MALE	FEMALE
WHO	94cm (37 inches)	80cm (32 inches)
Asians	90cm (35 inches)	80cm (32 inches)

Over the last decades, the high waist-hip ratio (>1.0 for men, >0.85 for women) accepted as one of the predictor for identifying patients with abdominal adipose tissue accumulation.

Measuring waist circumference

CLASSIFICATION OF OVERWEIGHT AND OBESITY BY BMI, WAIST CIRCUMFERENCE AND ASSOCIATED DISEASE RISK*

			Disease Risk* Relative to Normal Weight and Waist Circumference	
	BMI (kg/m²)	Obesity Class	Men ≤ 102 cm (≤ 40 in) Women ≤ 88 cm (≤ 35 in)	> 102 cm (> 40 in) > 88 cm (> 35 in)
Underweight	<18.5		—	—
Normal†	18.5 –24.9		—	—
Overweight	25.0 – 29.9		Increased	High
Obesity	30.0 – 34.9	I	High	Very High
	35.0 – 39.9	II	Very High	Very High
Extreme Obesity	≥40	III	Extremely High	Extremely High

MANAGEMENT OF OBESITY

WEIGHT LOSS AND MAINTENANCE:

1. DIET APPROACH:

Majority of obese patients required to reduce the calorie intake and modify the diet pattern according to calories. The dietary therapy for overweight patients is low calorie diet, which contain total calorie 800-1500 kcal per day. Low calorie diets contain all the nutrients and also decrease the other risk factors like high cholesterol and hypertension. In dietary therapy patient should be educated for

- Nutrient value of food
- Composition of food
- Reading nutrition label to know the calorie contents
- New habits to purchase low calorie diet
- During the food preparations, avoid adding high calorie ingredients like fat and oils.
- Avoid more consumption of high calorie food
- Maintain adequate water intake
- Limiting alcohol consumption

2. PHYSICAL ACTIVITY:

Increased physical activity alone can produce up to 2-3% weight loss. If associated with LCD the promoting weight loss is more. The physical activity alone can reduce the CVD risk factor.

3. BEHAVIOUR THERAPY:

Behavior therapy is provided to overcome the barrier for compliance with dietary therapy and physical activity. So behavior therapy is an important in weight reduction treatment. Most of the program includes the behavior therapy as packages with nutrition and physical activity.

4. COMBINED THERAPY:

To achieve the maximum benefit of weight reduction required the three components like dietary approach with LCD (low calorie diet), behavior therapy and exercise. This regimen should be followed for 6 months before starting pharmacotherapy.

5. PHARMACOTHERAPY:

No drug is approved by FDA for long term use more than 3 months. Weight loss drugs are indicated,

- for weight loss treatment with dietary and physical activity
- If BMI > 30 without obesity related co-morbidities
- If BMI > 27 with obesity related co-morbidities

WEIGHT LOSS DRUGS+

Drug	Action	Adverse Effects
dexfenfluramine* fenfluramine*	serotonin reuptake inhibitor serotonin releaser	valvular heart disease primary pulmonary hypertension neurotoxicity
sibutramine	norepinephrine, dopamine, and serotonin reuptake inhibitor	increase in heart rate and blood pressure
orlistat±	inhibits pancreatic lipase, decreases fat absorption	decrease in absorption of fat-soluble vitamins soft stools and anal leakage possible link to breast cancer

Weight reduction drugs should be used with lifestyle modifications. During the period of treatment, Continuous monitoring of drug efficacy and complication is necessary. Any drug potent to reduce the weight without the serious side effects, that drug can be continued. Otherwise it can be discontinued, and proceeded with surgery

6. SURGICAL MANAGEMENT:

Surgery is indicated in patient who are very obese, and when other therapies have failed and who are affected by the complication of obesity. Surgical intervention methods are gastroplasty, gastric partitioning, gastric bypass and vertical gastric banding.

BRONCHIAL ASTHMA

DEFINITION:

ATS/ERS[44] definition: Asthma is defined as "a clinical syndrome, characterized by increased trachea-bronchial tree responsiveness for a variety of stimuli. Major symptoms are paroxysms of dyspnoea, cough and wheezing, which may vary from mild to severe (status asthmaticus). The primary manifestation of this hyper-responsiveness is airways obstruction which is variable. This occurs like spontaneous fluctuations of severity of obstruction with substantial improvement in severity of obstruction followed by corticosteroids or bronchodilators, or increased severity of obstruction by drugs and other stimuli"

NIH definition[45]: "Asthma is characterized by repeated episodes of wheeze and dyspnoea, which is associated with partially reversible airway obstruction. Pathologically, it is defined inflammation of airways with infiltration of T cells, eosinophils and mast cells. Physiologically, increased airway responsiveness and immunologically, increased production of IgE antibodies to the environmental allergies"

EPIDEMIOLOGY OF ASTHMA

PREVALENCE:

Asthma is a major problem worldwide, affecting 300 million people. Based on standardized methods, the prevalence of asthma and wheezing in children and adults ranges from 1% to 18% of populations in worldwide[46]. In 2002, CDC conducted one survey which showed 72 individuals per 1000 (or) 20 million individuals have asthma and also observed that the rates are decreased with ages. Between 0 – 17 years 83 per 1000 children were affected compared to 68 per 1000 above 18 years.

Childhood asthma from population based prevalence estimated in India, the prevalence is increased in secular trend[47]. The incidence of new onset of asthma episodes in childhood is increased progressively. The median prevalence of childhood asthma in India is 3.3%, suggesting that childhood asthma prevalence is rising in India.

Jain et al[48], study showed that the prevalence of asthma to be 10.3% in South India. This is higher among the boys than girls. There was inverse association between increasing age and family history of asthma.

SOCIO-ECONOMIC BURDEN IN BRONCHIAL ASTHMA:

From asthma studies conducted in India, Latin America, Asia-Pacific, US and UK[49], the major socio-economic burden is absence from school and work. In New Zealand, 80% of resources are utilized for asthma patients and in India the cost of medication is estimated to be US$30 per month[50]. The monetary cost is estimated in UK and US are substantial[51]. By analysis of economic burden it was reported that attention need to put in both direct medical cost and indirect medical as well as non-medical costs[52]. Bronchial asthma is a major cause for absence from work which is a major burden in many countries, and it can be reduced by health care providers[53], individual efforts and asthma care organizations.

MORTALITY:

The WHO estimated that, due to asthma, about 15 million DALYs are lost in a year. It represents about 1% of global disease burden[53]. Death rates

annually due to bronchial asthma is estimated to be 2, 50,000 in worldwide which does not correlate with prevalence[54].

ETIOLOGICAL FACTORS FOR DEVELOPMENT OF BRONCHIAL ASTHMA

HOST FACTORS:

- Sex
- Obesity
- Genetic

ENVIRONMENTAL INFLUENCES:

- Allergens – mites, fungi, molds, yeasts, pollens, cockroach allergen.
- Infections
- Occupational sensitizers
- Air pollution
- Diet
- Smoking – active and passive

HOST FACTORS:

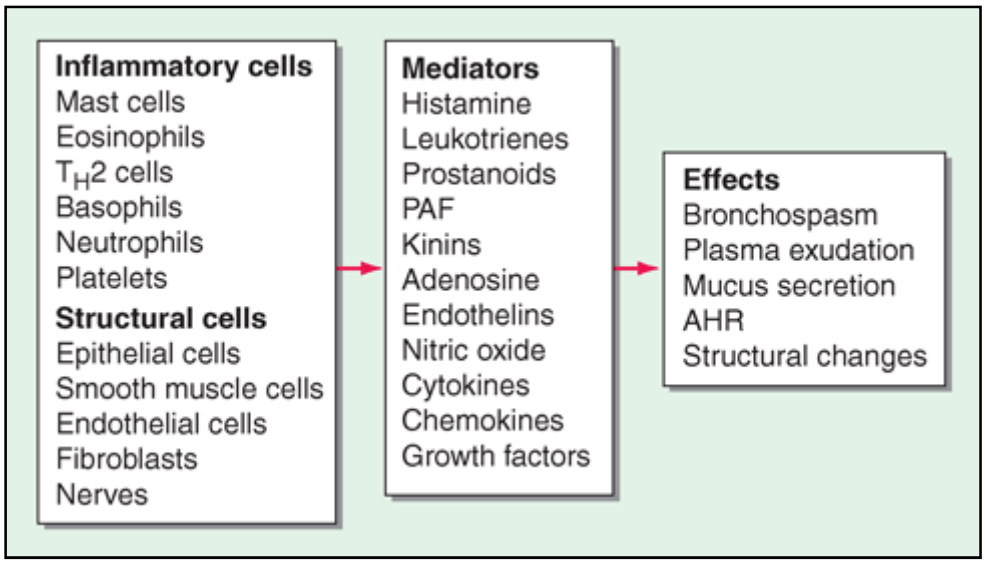
SEX:

The prevalence of asthma in younger age group before 14 years is twice common in boys than the girls. In more than 14 years of age group, female affected than male.

OBESITY:

Recent theory[58] explained that the increase in adipocytes in fats in obese individuals can cause systemic pro-inflammatory state. Fat cells raise the serum level of many cytokines, chemokines and soluble fractions of their receptors.

Adipose tissue secretes and also synthesizes many factors which are called adipokines. They include Interleukin-10, Interleukin-6, Tumour necrosis factor-α, TGF-β1, Eotoxin, C - reactive protein, Leptin and adiponectin



GENETIC FACTORS:

Multiple genes[55] are involved in development of bronchial asthma. The genes responsible for asthma has been coded on following,

- Production of allergen specific IgE[56] antibody
- Generation of inflammatory mediators
- Expression of airway hyper-responsiveness
- Determination of immune response

Chromosomal regions associated with susceptibility have been identified by several studies. For example, the gene responsible for elevated levels of IgE is located near major locus 5q.

ENVIRONMENTAL FACTORS:

ALLERGENS:

Many studies[62] explained that the indoor and outdoor allergens exposure and sensitization like house dust mite allergen, dog dander, cat dander, fungi are risk factors for development of asthma in children <3 years.

INFECTIONS:

Viral infections during infancy like parainfluenza virus, RSV may produce asthmatic symptoms in childhood. 40% RSV infected children have shown to continue to wheeze and develop asthma in later life[58, 59]. In some studies, infection with RSV and measles has shown protection against asthma development[60]. “The hygiene hypothesis” of asthma explains that early affected by infection in children leads to production of immune response in non allergic pathway thereby reducing the risk of development of asthma

OCCUPATIONAL SENSITIZERS:

Occupational sensitizer is defined as an agent, which is present in working environment leading to asthma. Occupational asthma[61] is associated with over 300 substances.

Smoking -tobacco:

Smoking is associated with reduction of lung function and increased asthma severity. It reduces the response to treatment with inhaled or systemic steroids. During pregnancy, maternal smoking has got the influence in lung development of the fetus. Infants of smoking mothers have 4 times more risk of developing wheeze in first year of life.

Air pollution:

Indoor and outdoor air pollution increases the risk of asthma exacerbations. It may be related to increased level of sensitized allergens.

Diet:

Children fed with cow's milk or formula feed have shown wheezing in early life when compared to children fed with breast milk. Increased use of processed foods, decreased antioxidants, decreased n-3 poly unsaturated fatty acids, and increased n-6 poly unsaturated fatty acids have been associated with recent increases in asthma and atopic diseases.

FACTORS CAUSING EXACERBATIONS OF ASTHMA

INFECTIONS:

VIRAL INFECTIONS:

80-85% of asthma exacerbations are associated with viral infections of the respiratory tract and two-third of infections is being due to picarnovirus. Next most common virus is corona virus which causes less severe exacerbation of bronchial asthma. Influenza virus, adenovirus, RSV, parainfluenza causes more severe exacerbations of bronchial asthma. Human metapneumo virus, a paramyxovirus, closely related to RSV can cause acute exacerbations of asthma in infants and young children.

RESPIRATORY SYNCYTIAL VIRUS:

It mainly affects all the children below 2 years of age. RSV is the common cause for bronchiolitis in infants and children. The pathogenesis of bronchiolitis is not clear. Two types of bronchiolitis is caused by RSV,

1. Eosinophil – positive bronchiolitis and 2.Eosinophil – negative bronchiolitis.

Infants most commonly affected by Eosinophil positive type may develop childhood asthma which induces strong TH2 response.

RHINO VIRUS:

Rhino virus is the most common cause for LRI and acute exacerbation of asthma in less than 2 years of age. Previously it was thought that rhino virus mainly affects upper respiratory tract. But now it is proved that optimal replication of rhino virus occurs in 33°C – 35°C. Thermal mapping of airways is an important mechanism to replicate the rhinovirus in lower respiratory tract.

BACTERIAL INFECTIONS:

Sino nasal inflammation significantly worsens the lower airway disease. Organisms cultured from maxillary sinus aspirate are Moraxella catarrhalis, H.influenza and Streptococcus pneumonia. Effective treatment for sinusitis can improve the clinical symptoms of ashma[32]. Chronic sinusitis is also playing important role in difficult to control asthma. In asthmatic patients respiratory airway epithelium shows goblet cell hyperplasia which increases production of mucus secretion. This increased mucus secretion can act as nidus for localized infection which will produce invasive infection to other sites.

ATYPICAL BACTERIAL INFECTION:

Mycoplasma pnemoniae and Chlamydia pneumonia significantly affect children, especially causing recurrent episodes of wheezing. It plays a potential role in exacerbation of childhood asthma. The incidence is increased with age. Telithromycin, a new ketolide antibiotic, can control the acute exacerbation of asthma. The ketolide and macrolide antibiotics have immuno-modulatory effects in vivo and in vitro, on migration of neutrophils and production of pro-inflammatory mediators[32].

ALLERGENS:

Aeroallergens:

Epidemics of asthma exacerbation occur in late spring and summer. In this season, the level of Alternatio and Claudosporium species is increased. Sensitization to these moulds is associated with asthma exacerbations and hospitalization. Sensitization to mites, cockroaches and cats is found to have a significant association with worsening of asthma symptoms.

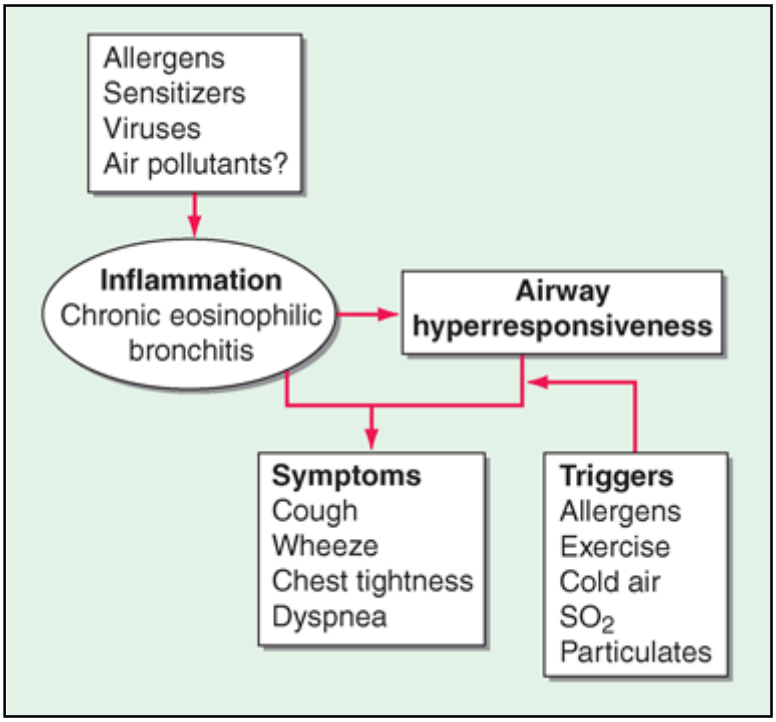
Food additives and allergens:

Sulphites are used as preservatives in drugs and foods like, dehydrated vegetables, fruit mixtures and dried fruits. Sulphites agents are sulphur dioxide, sodium sulphite, sodium and potassium bisulphite, and meta bisulphate. Exposures to sulphites can cause significant bronchospasm in airway smooth muscles. The major food products producing asthma in children include milk, wheat, soy, eggs, fish, peanut, shellfish and tree nuts.

EXPOSURES

OCCUPATIONAL SENSITIZERS:

Occupational asthma is defined as bronchial inflammation caused by direct inhalation of dust, fumes, gases and vapours in work place. Allergic occupational asthma caused by exposure to high molecular weight allergens and some low molecular weight allergens. HMW agents are protein derivatives from food, plants and animals, which stimulate the TH2 immune response with production of IgE. LMW agents, like antibiotics and metals, also stimulate the TH2 response.



ENVIRONMENTAL EXPOSURE:

Environmental factors associated with worsening of asthma symptoms are exercise, tobacco smoke, cold air, environmental pollutants. Exercise induced asthma causes the transient narrowing of airways followed by exercise. “The thermal hypothesis” is the main mechanism for bronchoconstriction after exercise. Exercise induced asthma individuals show increased production of cysteinyl leukotrienes in sensory nerve ends.

Outdoor polluted air can cause asthma exacerbations. Polluted air contains mixture of nitrogen dioxide, lead, ozone, sulphur dioxide and carbon monoxide. Motor vehicle exhaust emission contains carbon, carbon monoxide and nitrogen dioxide. Short term exposure to this emission produces neutrophilic inflammation of airways[27].

Tobacco smoke exposure is a significant risk factor for asthma exacerbations. According to recent studies, smoking in the home is significantly related to asthma exacerbation in pre-school children[37].

HORMONAL FACTORS:

Some female shows the premenstrual worsening of asthma. The mechanisms are not completely understood. Some theories explain this due to reduction of progesterone. Hypothyroidism and hyperthyroidism both will worsen the asthma.

DRUGS:

Aspirin and other NSAIDs and beta blockers are associated with asthma exacerbations

GERD:

Clinical and experimental data have been demonstrated that GERD can cause bronchial asthma. Mechanism for GERD induced asthma is mainly due to vagally mediated reflux theory and micro aspirations. The prevalence of GERD among asthma patients is wide, ranging from 30% to 90% in several studies[6-9].

CLASSIFICATION OF ASTHMA SEVERITY

According to GINA guidelines, the severity of bronchial asthma is classified based on symptoms, airflow limitations and pulmonary function tests.

1. Intermittent asthma
2. Mild persistent asthma
3. Moderate persistent asthma
4. Severe persistent asthma

INTERMITTENT ASTHMA:

- Symptoms <1 time in a week
- Asymptomatic
- Symptoms in night <2 times in a month
- FEV1 > 80%
- PEFR variability <20%

MILD PERSISTENT ASTHMA:

- Symptoms >1time in a week, <1 time in a day
- Attacks may affect activity
- Night time symptoms >2times in a month
- FEV1 > 80%
- PEFR variability 20-30%

MODERATE PERSISTENT ASTHMA:

- Symptoms occur daily
- Attacks affects activity
- Night symptoms > 1time a week
- FEV1 60-80%
- PEFR variability > 30%

SEVERE PERSISTENT ASTHMA:

- Continuous symptoms of wheezing
- Restriction of physical activity
- Frequent symptoms in night
- FEV1 < 60%
- PEFR variability > 30%

CRITERIA:

The presence of one of the above feature of severity is enough to place a patient in that category.

CLINICAL FEATURES

Symptoms:

- Wheezing
- Dyspnoea / tachypnoea
- Coughing
- Patient feels difficulty in filling of air in lungs
- Symptoms worsening at night and wake up in early morning
- Increased mucus production

Signs:

- Inspiratory and expiratory rhonchi all over the chest
- Accessory muscles acting
- Tachypnoeic
- Silent chest in severe asthma

DIAGNOSIS

Usually diagnosed by symptoms of airway obstruction and objective measurement of pulmonary function test.

Pulmonary function tests:

- Spirometry shows reduced FEV1, FEV1/FVC ratio and PEF.
- Reversibility test can be documented by > 12% and 200ml increases in FEV1 after 15 minutes of inhalation of short acting beta 2 agonists or 2 to 4 weeks trial of oral corticosteroids.
- PEFR variability twice daily in morning and evening measurements confirm the diurnal variations of air flow obstruction.
- Flow volume loop shows reduced maximum expiratory flow and reduced peak flow rate.
- Other lung functions are rarely needed.

Airway responsiveness:

Airway hyper responsiveness is normally measured by histamine challenge or methacholine test. This is rarely useful nowadays in clinical practice. In suspected exercise induced asthma, exercise test is done for demonstration of post exercise bronchoconstriction.

Hematological tests:

Blood tests are not helpful. Total serum IgE and specific IgE for inhaled allergens (RAST – radio allegro sorbent test) are measured for some patients.

Chest x-ray:

Chest X-ray will be normal. Some patients may show hyper-inflated lung.

Skin tests:

Skin prick tests for common inhalant allergens will be positive in allergic asthma. But this is not useful for diagnosis.

Exhaled nitric oxide:

It is a non-invasive test to measure airway inflammation. Increased level of exhaled nitric oxide in asthma is reduced by inhalational corticosteroid therapy. So it will be useful to demonstrate sufficient anti-inflammatory therapy.

TREATMENT

AIMS OF ASTHMA TREATMENT

- Minimal nocturnal and chronic symptoms
- Minimal acute exacerbations
- Near normal lung function test
- PEF variability < 20%
- No emergency room visit
- Minimal use of beta agonist
- No limitations of physical activities

Drugs used for bronchial asthma:

- **Bronchodilators**
- **Controllers**

BRONCHODILATORS:

It acts on airway smooth muscles and relieves the bronchoconstriction. It gives a rapid relief of symptoms. It has little effect on inflammatory process.

Three classes of bronchodilators

- Beta adrenergic agonists
- Anticholinergics
- Theophylline

BETA 2 AGONISTS:

It acts on beta receptor, which joines with stimulatory G protein to adenyl cyclase, and it increases cyclic AMP to cause relaxation of smooth muscle cells of airways and inhibits the inflammatory cells like mast cells.

Effects of beta 2 agonists on airways:

- Relax the airway smooth muscle
- Inhibits the mediator from mast cells
- Increased mucociliary clearance in airways
- Inhibits the plasma exudation and airway oedema
- Increase the mucus secretion
- Decreased cough
- No effect on inflammatory process

Beta 2 agonists are usually given by inhalation which can be divided in to

- SABA (short acting beta 2 agonists)
- LABA (long acting beta 2 agonists)

SABA – albuterol and terbutaline, has short life of 3-6 hrs. It is useful for symptom relief and exercise induced asthma.

LABA – salmeterol and formoterol, has duration of action for about 12 hrs. It is used in uncontrolled asthma. It should be used with Inhaled

corticosteroids and should not be given without ICS. It does not control underlying inflammation.

Anticholinergics:

Ipratropium bromide, which prevents cholinergic nerve induced bronchoconstriction and mucus secretion. It is less effective than beta 2 agonists.

Theophylline:

It causes bronchodilatation by inhibiting the action of phophodiesterase enzyme in airway smooth muscle. In lower doses it has anti-inflammatory effects. It activates the nuclear enzymes, histone deacetylase-2, which switch-off the activated inflammatory genes.

CONTROLLER THERAPIES:

Inhaled Corticosteroids:

ICS are the most effective anti-inflammatory agent in asthma therapy. It reduces the eosinophils in sputum and airways. It also reduces the mast cells and activated T cells in airways. This is the first line of treatment for bronchial asthma .If symptoms did not control with ICS, step up to LABA

Systemic Corticosteroids:

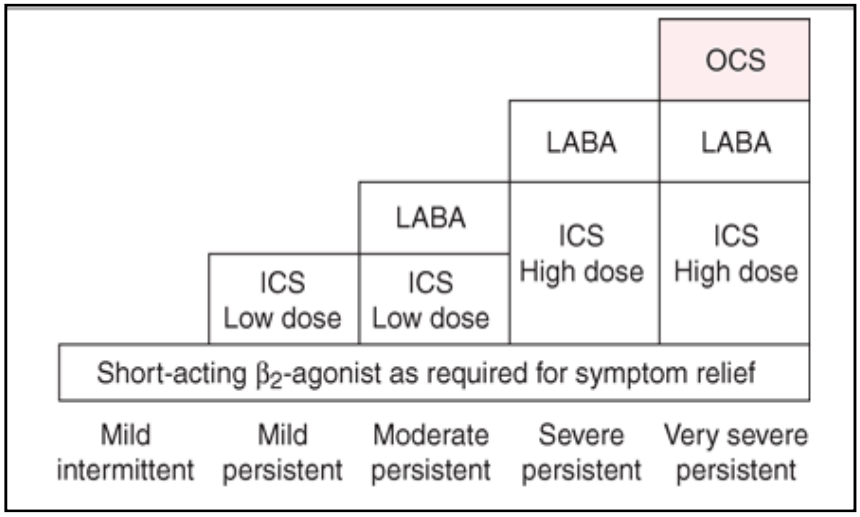
This can be used in oral and intravenous route. Intramuscular Triamcinolone acetonide is given like depot preparation in noncompliant persons

OTHER CONTROLLER THERAPY:

- **Anti-leukotrienes -** Montelukast, Zafirlukast
- **Cromones** - Cromolyn sodium, Nedocromil sodium

MANAGEMENT OF CHRONIC ASTHMA:

All mild intermittent and persistent asthma treated with short acting beta-2 agonist. If symptoms were not controlled with short acting beta-2 agonist, start inhalational corticosteroids and then add LABA. For treatment of chronic asthma stepwise approach was advised.



STEPWISE APPROACH FOR CHRONIC ASTHMA

MATERIALS AND METHODS

SETTING:

The study was conducted in Rajiv Gandhi government general hospital, Chennai.

DESIGN OF STUDY:

It is an observational type of study. Interview technique was used to collect information on predesigned proforma.

PERIOD OF STUDY:

This study was conducted in a time period from Jun 2013 to Nov 2013.

SAMPLE SIZE:

One hundred cases of bronchial asthma.

INCLUSION CRITERIA:

- All bronchial asthma patients
- Age group between 20- 40 years of age
- All the patients diagnosed clinically and satisfying the spirometric criteria were included in this study.

EXCLUSION CRITERIA:

- COPD
- Smoking
- Age less than 20 years and more than 40 years
- Pregnancy
- Hypothyroidism
- Co morbid conditions like Ischemic heart disease, congestive cardiac failure, valvular heart disease
- Obstructive sleep apneoa

METHODS:

All asthma patients were selected from asthma clinic in the institute of internal medicine, Rajiv Gandhi Government general hospital, Chennai. Only 20 to 40 years old, known asthmatic patients were subjected to spirometry reversibility test and confirmed according to criteria. History was obtained from all the patients and the cases were subjected to pulmonary function tests. Patients were divided into four categories of bronchial asthma by severity based on GINA guidelines.

Class1: Mild intermittent bronchial asthma

Class2: Mild persistent bronchial asthma

Class3: Moderate persistent bronchial asthma

Class4: Severe persistent bronchial asthma

Body mass index was calculated according to Quetelet index by the formula,

BMI= weight (in kg) / height (in meter)^2

According to the BMI, all patients were divided into three categories based on Indian standard.

- Class1: 18.5 to 22.9 - Normal
- Class2: 23.0 to 24.9 - Overweight
- Class3: >25 - Obese

All individuals were subjected to complete blood count examination, renal function test, liver function test, thyroid function test, chest X-ray, electrocardiogram, pulmonary function tests and C- reactive protein. C-reactive protein is an inflammatory mediator which is in obesity also.

All three categories of BMI were compared with four categories of severity class of bronchial asthma and analyzed for significant correlation.

STATISTICAL ANALYSIS

All patients in the two categories were analyzed by Chi-square test and t-test for significance.

SPIROMETRY

Several tests are used to study various aspects of pulmonary functions. Among this, spirometry is the most basic and useful method. Spirometry is a simple test. It measures air flow from fully inflated lung overtime in litres. FVC, FEV1 and PEFR are calculated by spirometry.

SELECTION OF SPIROMETER

The American Thoracic society recommends that

- It can be calibrated with a three litre syringe
- It should record at least FVC and FEV1
- It should record a flow-volume curve or a flow-volume loop or both(if possible)

CONTRAINDICATIONS

- Within 1 month of myocardial infarction
- Recent abdominal surgery

Patients with any of the conditions listed below are unlikely to achieve optimal or reproducible results.

- Chest or abdominal pain of any cause
- Oral or facial pain exaggerated by a mouth piece
- Stress incontinence

- Dementia or confused state

PERFORMING SPIROMETRY

According to current ATS statement, a spirometry may be performed either in sitting or standing position. Sitting position is considered safe. In obese subject, standing positions may be preferred.

THINGS TO AVOID BEFORE TEST

- Smoking within one hour of test
- Consuming alcohol within four hours of test
- Performing vigorous exercise within thirty minutes of testing
- Wearing clothes that substantially restrict chest wall and abdominal expansion
- Eating large meal within two hours of test

SPIROMETRIC MANEUVER

The procedure was instructed and demonstrated to the patient. The patient then performs spirometry in following steps.

Expiratory maneuver

- Take a full deep breath away from the spirometer
- Hold the mouth piece between the lips to get a good seal
- Expire as fast and as hard as possible until no breath is left

Expiratory and inspiratory maneuver

i. Hold the mouth piece between the lips to get a good seal
ii. Breath in and out for two to three tidal breaths
iii. Expire as fast and as hard as possible until no breath is left
iv. Inspire rapidly to maximum capacity

REVERSIBILITY TESTING

Spirometry is recorded fifteen to thirty minutes after administration of short acting beta-2 agonists. Eg.200 to 400 microgram of salbutamol is used

Calculation of percentage improvement

$$\frac{\textbf{FEV1 (post bronchodilator) – FEV1 (baseline)}}{\textbf{FEV1 (baseline)}} \times 100$$

Good bronchodilator reversibility is indicated by improvement in FEV1 by 200 ml and >12% of previous values

OBSERVATION AND RESULTS

TABLE-1

AGE DISTRIBUTION

AGE(YEARS)	NUMBER	PERCENTAGE %
20-25	36	36
26-30	15	15
31-35	16	16
36-40	33	33
Total	100	100

In our study, 100 patients were included. All are adult age group between 20-40years. In this, the major age group is 20-25 years (n=36). The least age group is between 26-30 years (n=15)

CHART-1

AGE DISTRIBUTION

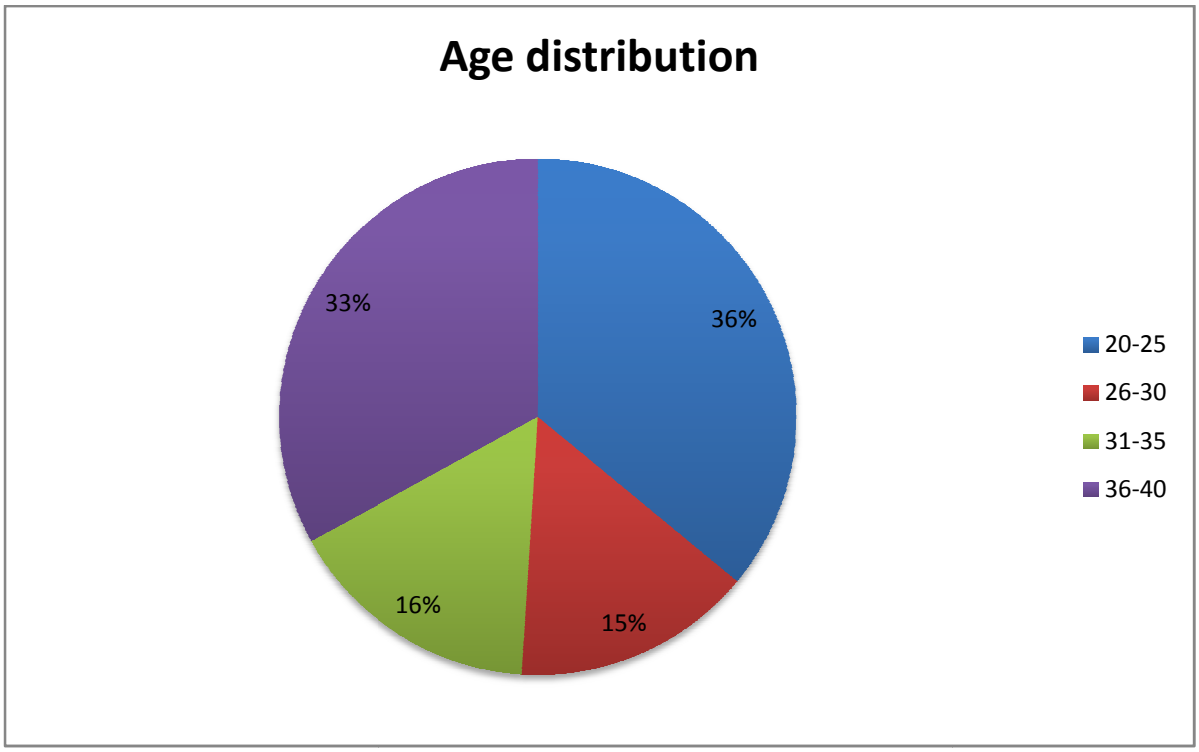


TABLE-2

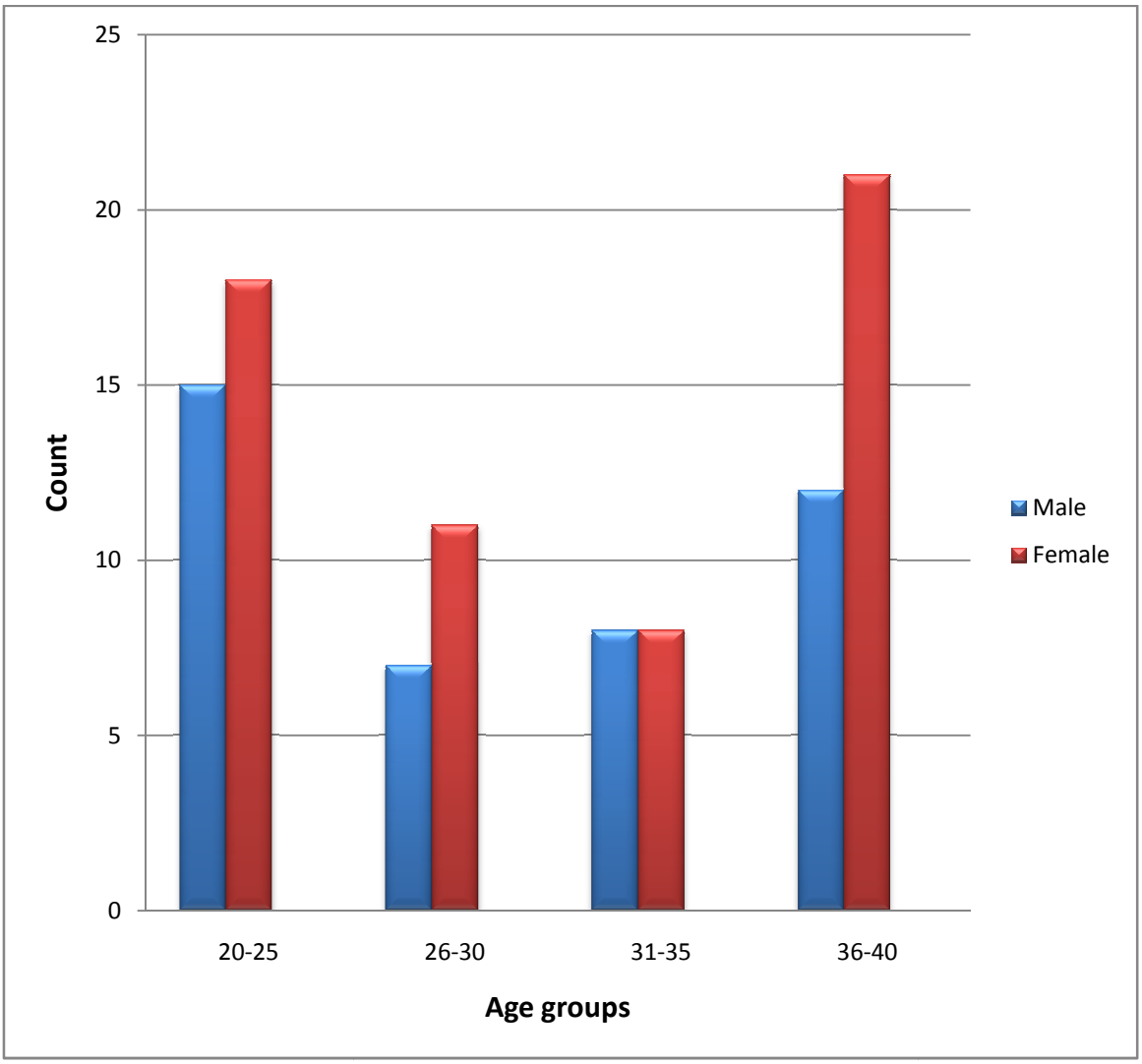
AGE – SEX DISTRIBUTION

AGE GROUPS (IN YEARS)	MALE	FEMALE	TOTAL
20 – 25	16	20	36
26 – 30	6	9	15
31 – 35	8	8	16
36 – 40	12	21	33
Total	42	58	100

In our study, out of 100 patients, 58 female were affected by asthma only 42 male were involved. In female, the most common age group is between 36-40years. In male, the common age group in our study is between 20-25 years. In this study, male are affected earlier than female

CHART 2

AGE – SEX DISTRIBUTION



Sex ratio of this study group is 1:1.4.

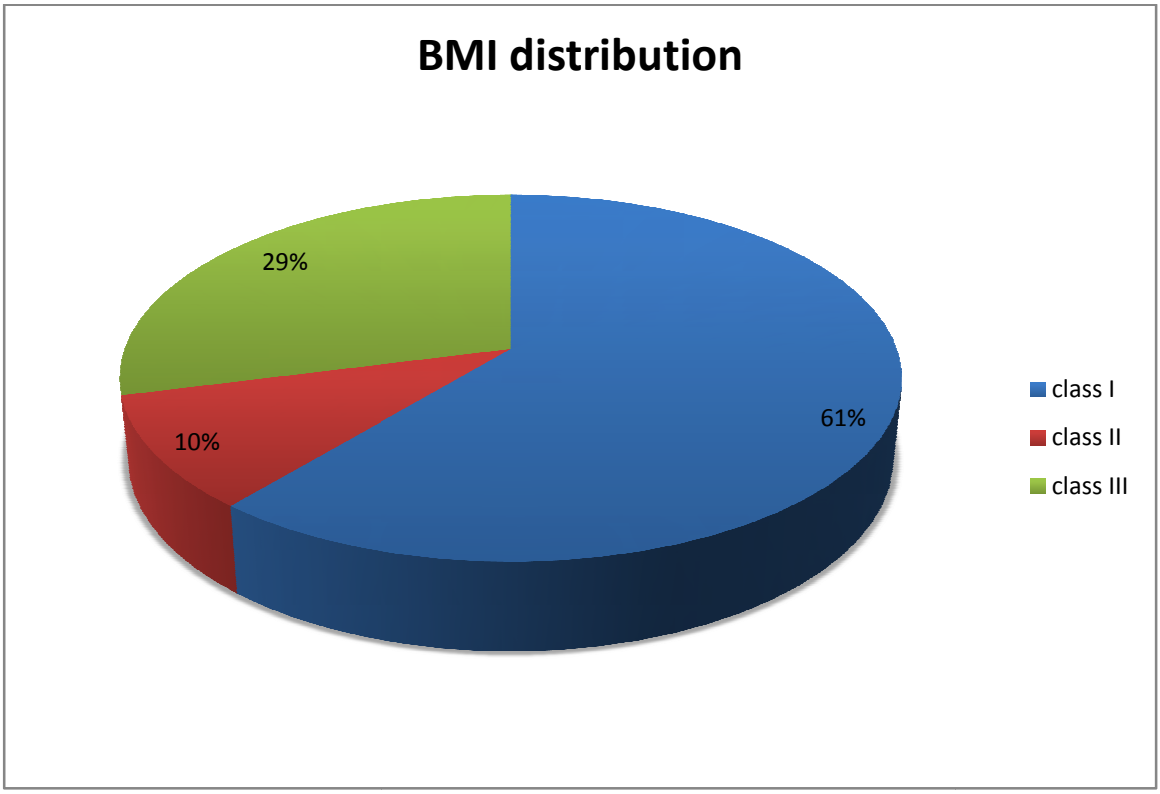
TABLE-3

BMI Distribution

BMI CLASS	NUMBER	PERCENTAGE %
I -NORMAL	61	61
II-OVERWEIGHT	10	10
III- OBESITY	29	29
Total	100	100

Out of 100patients were studied, classified into three category of BMI based on Indian type. Large number of patients are under the category of normal BMI (n=61). Least number of patients are under the category of overweight BMI (n=10).

CHART 3


BMI distribution
29%
10%
61%
class I
class II
class III

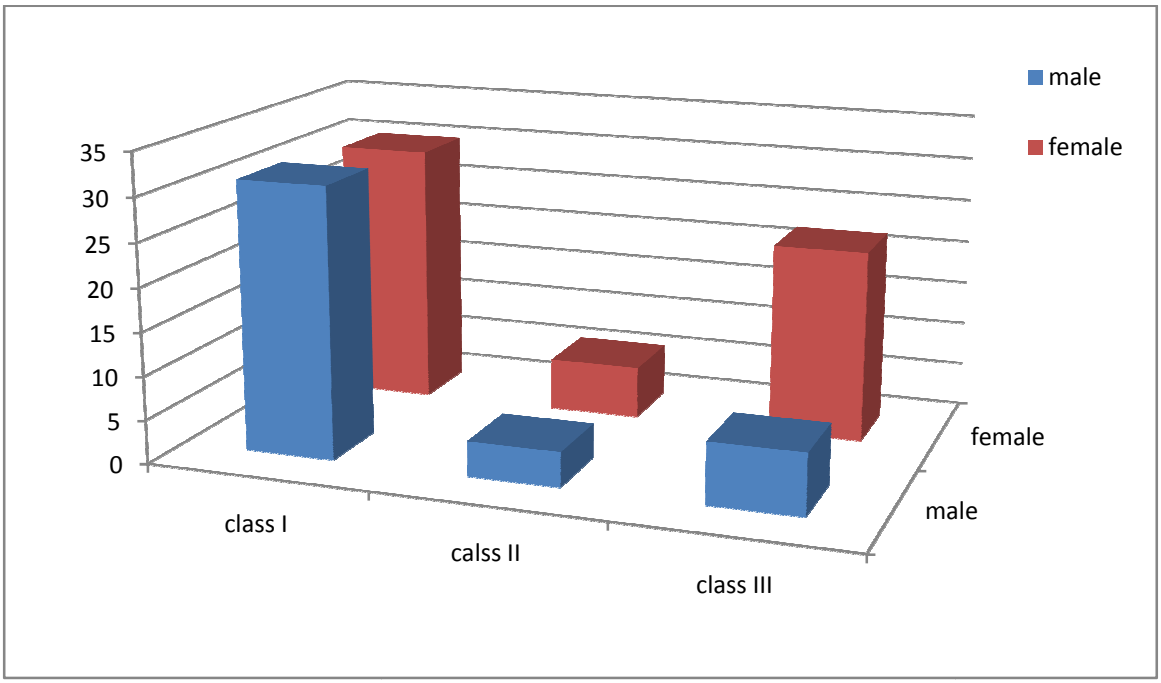

male
female
35
30
25
20
15
10
5
0
class I
calss II
class III
female
male

TABLE-4

AGE & BMI DISTRIBUTION

BMI CLASS		AGE IN YEARS				TOTAL
		20-25	26-30	31-35	36-40	
I	Count	32	7	11	11	61
	% within Class of BMI	52.5%	11.5%	18.0%	18.0%	100.0%
	% within Age in years	88.9%	46.7%	68.8%	33.3%	61.0%
II	Count	2	2	1	5	10
	% within Class of BMI	20.0%	20.0%	10.0%	50.0%	100.0%
	% within Age in years	5.6%	13.3%	6.3%	15.2%	10.0%
III	Count	2	6	4	17	29
	% within Class of BMI	6.9%	20.7%	13.8%	58.6%	100.0%
	% within Age in years	5.6%	40.0%	25.0%	51.5%	29.0%
	Total	36	15	16	33	100

In three group of BMI, highest is class I. Among the class I, highest age group is between 20-25 years (n=32). Among the study , least number of patients involved in class II and age group between 31-35 years (n=1)

TABLE-5

SEX & BMI DISTRIBUTION

CLASS OF BMI		SEX		Total
		MALE	FEMALE	
I	Count	31	30	61
	% within Class of BMI	50.8%	49.2%	100.0%
	% within Sex	73.8%	51.7%	61.0%
II	Count	4	6	10
	% within Class of BMI	40.0%	60.0%	100.0%
	% within Sex	9.5%	10.3%	10.0%
III	Count	7	22	29
	% within Class of BMI	24.1%	75.9%	100.0%
	% within Sex	16.7%	37.9%	29.0%
	Total	42	58	100

In our study, Female is the overall highest group (n=58). In class I sex ratio is 1:1. Sex ratio in class II is 1:1.5. Sex ratio in class III is 1:2. Male group is highest in class I (n=31)

TABLE-6

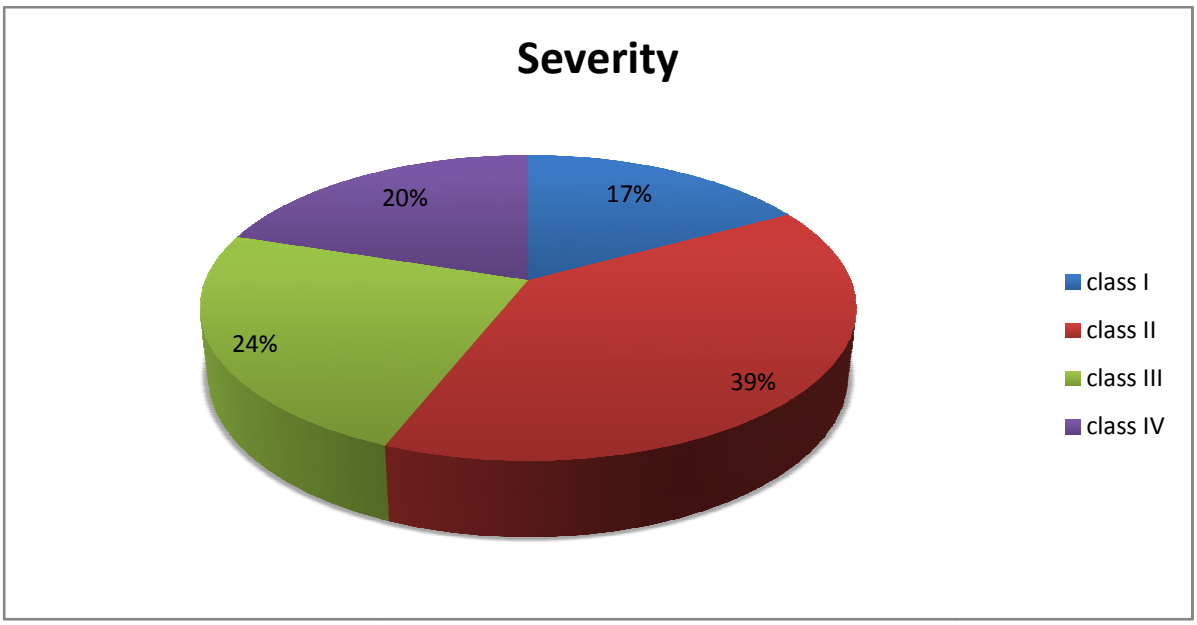
DISTRIBUTION OF SEVERITY OF BRONCHIAL ASTHMA

CLASS	NUMBER	PERCENTAGE%
I- Mild intermittent	17	17
II- Mild persistent	39	39
III- Moderate persistent	24	24
IV- Severe persistent	20	20
Total	100	100

Out of 100 patients, who were divided into four class of severity of asthma, more number of patients came under class II (n=39). Least number of patients came under class I (n=17)

CHART-4

DISTRIBUTION OF SEVERITY OF BRONCHIAL ASTHMA



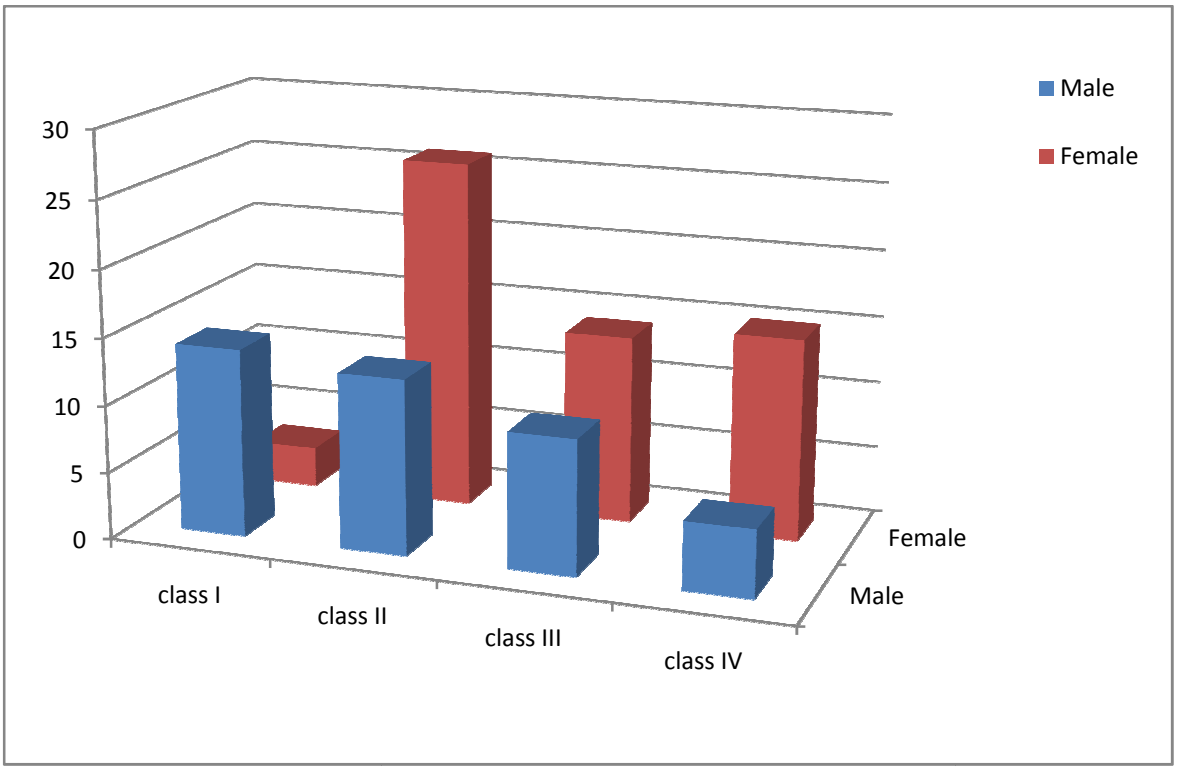


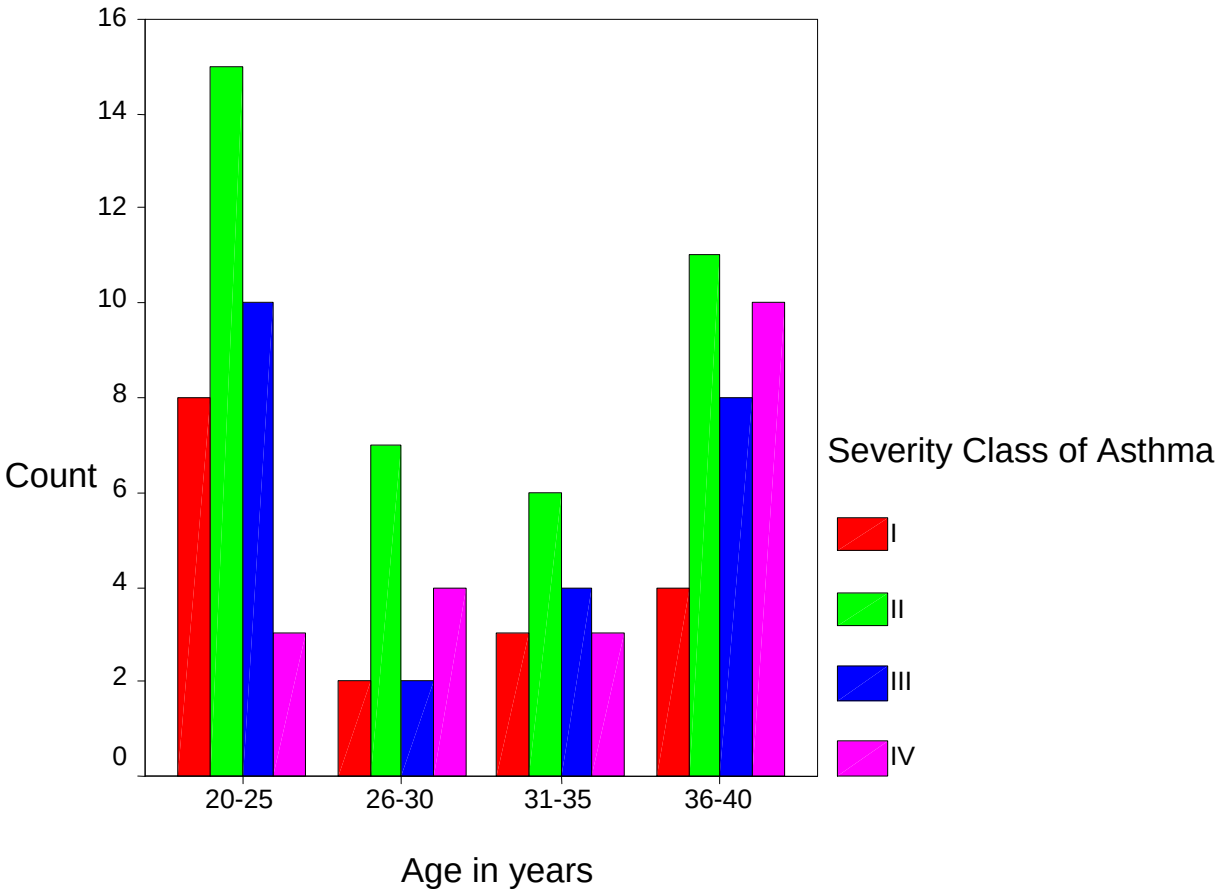
TABLE-7

CORRELATION BETWEEN AGE & SEVERITY OF ASTHMA

Age in years		Severity Class of Asthma				Total	P value
		I	II	III	IV		
20-25	Count	8	15	10	3	36	
	% within Age in years	22.2%	41.7%	27.8%	8.3%	100.0%	
	% within Severity Class of Asthma	47.1%	38.5%	41.7%	15.0%	36.0%	
26-30	Count	2	7	2	4	15	
	% within Age in years	13.3%	46.7%	13.3%	26.7%	100.0%	
	% within Severity Class of Asthma	11.8%	17.9%	8.3%	20.0%	15.0%	
31-35	Count	3	6	4	3	16	0.612
	% within Age in years	18.8%	37.5%	25.0%	18.8%	100.0%	
	% within Severity Class of Asthma	17.6%	15.4%	16.7%	15.0%	16.0%	Not significant
36-40	Count	4	11	8	10	33	
	% within Age in years	12.1%	33.3%	24.2%	30.3%	100.0%	
	% within Severity Class of Asthma	23.5%	28.2%	33.3%	50.0%	33.0%	
	Total	17	39	24	20	100	

CHART-5

CORRELATION BETWEEN AGE & SEVERITY OF ASTHMA



In this study, the higher number of patients are in the age group between 20-25 years (n=15). Chi square test was applied to test the significance between age group and severity of bronchial asthma. There was no significant difference (p=0.65) was found between the two variables.

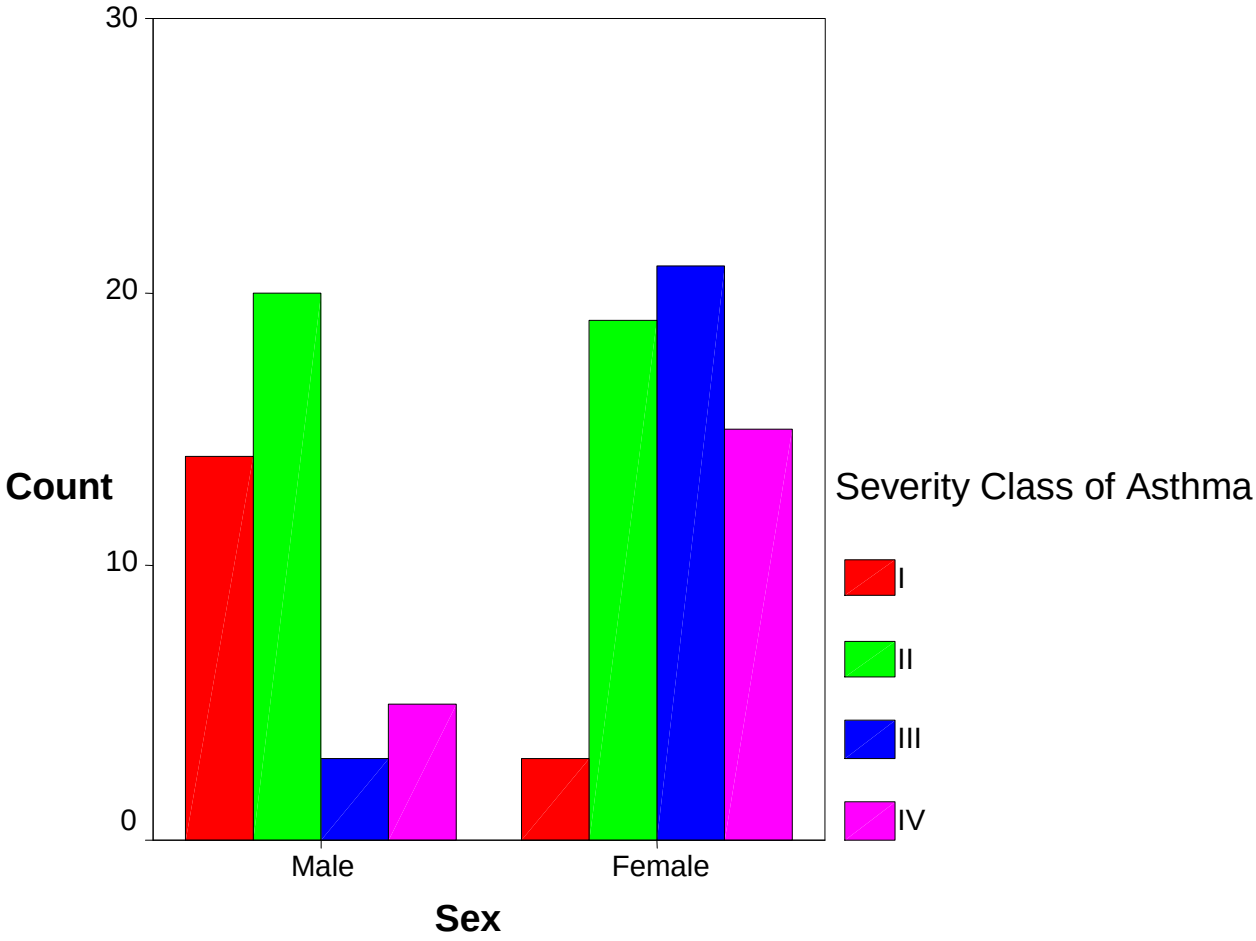
TABLE-8

CORRELATION BETWEEN SEX & SEVERITY OF ASTHMA

SEX		SEVERITY CLASS OF ASTHMA				TOTAL	P VALUE
		I	II	III	IV		
Male	Count	14	20	3	5	42	<0.001 SIGNIFICANT
	% within Sex	33.3%	47.6%	7.1%	11.9%	100.0%	
	% within Severity Class of Asthma	82.4%	51.3%	12.5%	25.0%	42.0%	
Female	Count	3	19	21	15	58	
	% within Sex	5.2%	32.8%%	36.2%	25.9%	100.0%	
	% within Severity Class of Asthma	17.6%	48.7%	87.5%%	75.0%	58.0%	
	TOTAL	17	39	24	20	100	

CHART-6

CORRELATION BETWEEN SEX & SEVERITY OF ASTHMA



Out of 100 patients studied, majority of male patients came under the asthma severity class II & I and majority of female patients came under asthma severity class III & II. Among the asthma severity class III & IV, majority of them was females. It showed significant (p=<0.001) correlation between sex and severity of asthma

TABLE-9

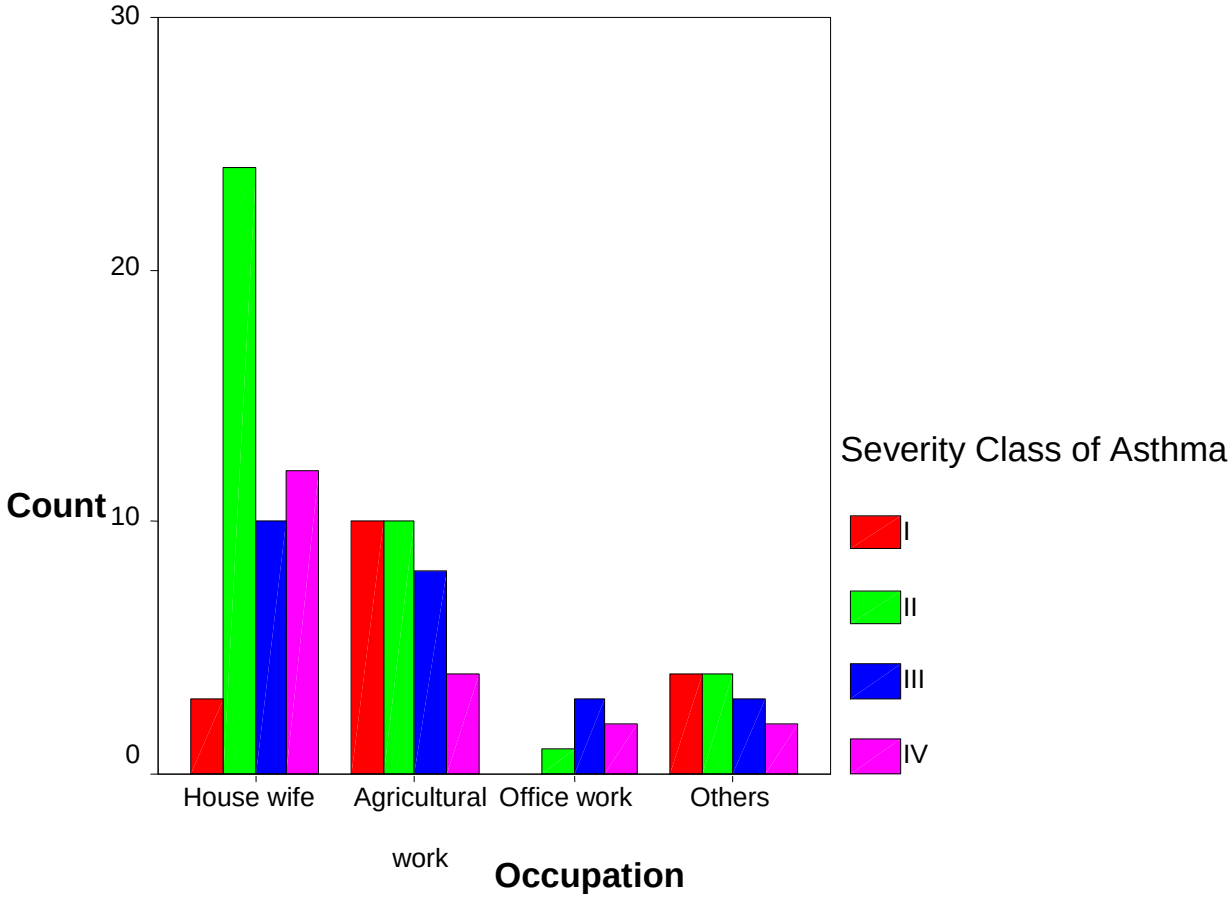
CORRELATION BETWEEN OCCUPATION &

SEVERITY OF ASTHMA

Occupation		Severity Class of Asthma				Total	P value
		I	II	III	IV		
House wife	Count	3	24	10	12	49	
	% within Occupation	6.1%	49.0%	20.4%	24.5%	100.0%	
	% within Severity Class of Asthma	17.6%	61.5%	41.7%	60.0%	49.0%	
Agricultural work	Count	10	10	8	4	32	
	% within Occupation	31.3%	31.3%	25.0%	12.5%	100.0%	
	% within Severity Class of Asthma	58.8%	25.6%	33.3%	20.0%	32.0%	
Office work	Count	0	1	3	2	6	0.058 **SIGNIFICANT**
	% within Occupation	.0%	16.7%	50.0%	33.3%	100.0%	
	% within Severity Class of Asthma	.0%	2.6%	12.5%	10.0%	6.0%	
Others	Count	4	4	3	2	13	
	% within Occupation	30.8%	30.8%	23.1%	15.4%	100.0%	
	% within Severity Class of Asthma	23.5%	10.3%	12.5%	10.0%	13.0%	
	Total	17	39	24	20	100	

CHART-7

CORELATION BETWEEN OCCUPATION & SEVERITY OF ASTHMA



In our study, majority of patients were house wife (n=49) followed by agricultural workers. Chi square test showed significant (p=0.058) correlation.

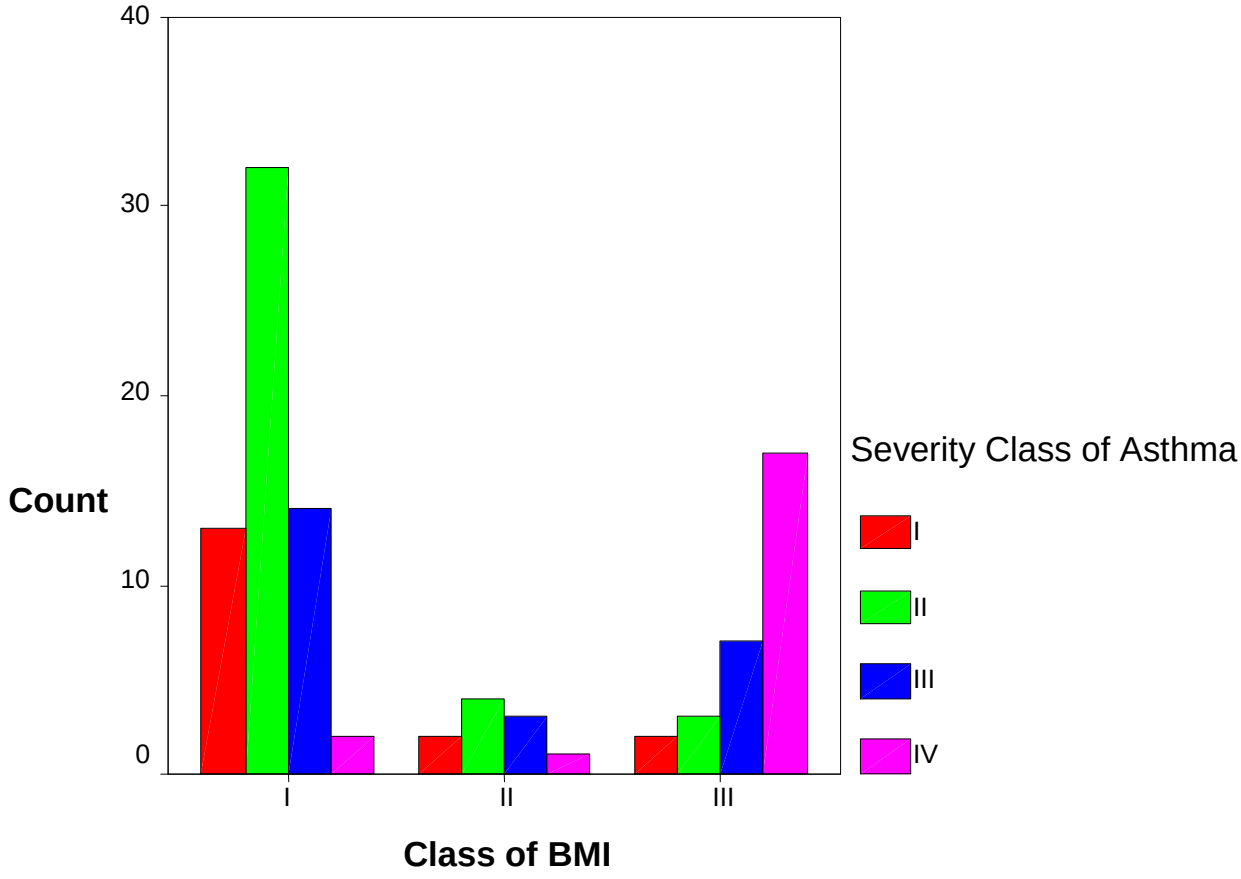
TABLE-10

CORRELATION BETWEEN BMI & SEVERITY OF ASTHMA

CLASS OF BMI		SEVERITY CLASS OF ASTHMA				TOTAL	P VALUE
		I	II	III	IV		
I	Count	13	32	14	2	61	<0.001 SIGNIFICANT
	% within Class of BMI	21.3%	52.5%	23.0%	3.3%	100.0%	
	% within Severity Class of Asthma	76.5%	82.1%	58.3%	10.0%	61.0%	
II	Count	2	4	3	1	10	
	% within Class of BMI	20.0%	40.0%	30.0%	10.0%	100.0%	
	% within Severity Class of Asthma	11.8%	10.3%	12.5%	5.0%	10.0%	
III	Count	2	3	7	17	29	
	% within Class of BMI	6.9%	10.3%	24.1%	58.6%	100.0%	
	% within Severity Class of Asthma	11.8%	7.7%	29.2%	85.0%	29.0%	
	Total	17	39	24	20	100	

CHART-8

CORRELATION BETWEEN BMI & SEVERITY OF ASTHMA



In our study, the majority of patients with BMI class III came under class IV of asthma severity. Chi square applied showed significance (p=<0.001). It implies that obese patients are at increased risk of developing bronchial asthma.

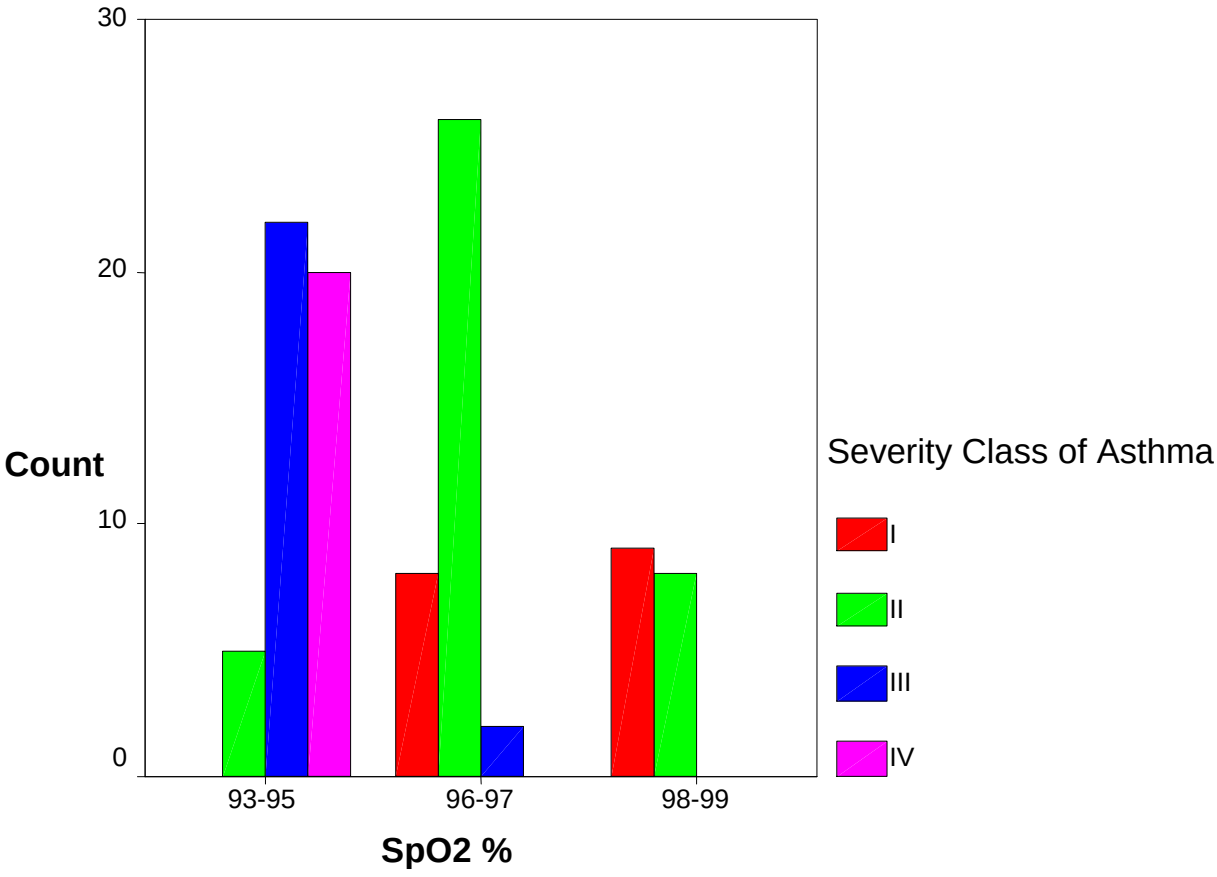
TABLE-11

CORRELATION BETWEEN SPO2 AND SEVERITY OF ASTHMA

SPO2 %		SEVERITY CLASS OF ASTHMA				TOTAL
		I	II	III	IV	
93-95	Count	0	5	22	20	47
	% within Spo2 %	.0%	10.6%	46.8%	42.6%	100.0%
	% within Severity Class of Asthma	.0%	12.8%	91.7%	100.0%	47.0%
96-97	Count	8	26	2	0	36
	% within Spo2 %	22.2%	72.2%	5.6%	.0%	100.0%
	% within Severity Class of Asthma	47.1%	66.7%	8.3%	.0%	36.0%
98-99	Count	9	8	0	0	17
	% within Spo2 %	52.9%	47.1%	.0%	.0%	100.0%
	% within Severity Class of Asthma	52.9%	20.5%	.0%	.0%	17.0%
	Total	17	39	24	20	100

CHART 9

CORRELATION BETWEEN SPO2 AND SEVERITY OF ASTHMA



In this study, the SPo2 varies from 93% – 99% according to the asthma severity. The majority of patients in class IV asthma severity had SpO2 between 93% to 95% and class I asthma severity had SpO2 between 98% to 99%.

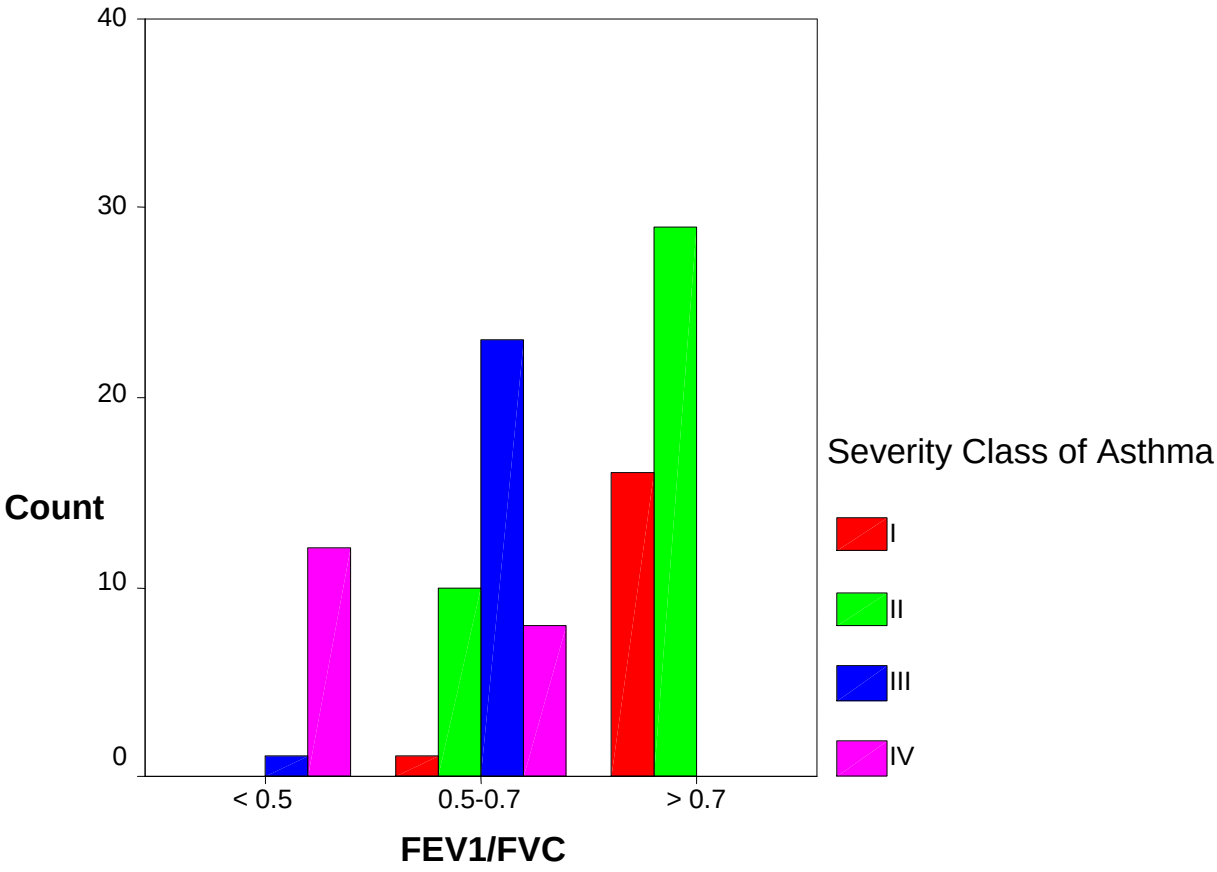
TABLE-12

CORRELATION BETWEEN FEV1/FVC RATIO & SEVERITY OF ASTHMA

FEV1/FVC		SEVERITY CLASS OF ASTHMA				TOTAL
		I	II	III	IV	
< 0.5	Count	0	0	1	12	13
	% within FEV1/FVC	.0%	.0%	7.7%	92.3%	100.0%
	% within Severity Class of Asthma	.0%	.0%	4.2%	60.0%	13.0%
0.5-0.7	Count	1	10	23	8	42
	% within FEV1/FVC	2.4%	23.8%	54.8%	19.0%	100.0%
	% within Severity Class of Asthma	5.9%	25.6%	95.8%	40.0%	42.0%
> 0.7	Count	16	29	0	0	45
	% within FEV1/FVC	35.6%	64.4%	.0%	.0%	100.0%
	% within Severity Class of Asthma	94.1%	74.4%	.0%	.0%	45.0%
	Total	17	39	24	20	100

CHART-10

CORRELATION BETWEEN FEV1/FVC RATIO & SEVERITY OF ASTHMA



In our study out of 100 patients, FEV1 / FVC ratio varies according to the asthma severity. Large number of patients in class IV had FEV1/FVC ratio < 0.5.

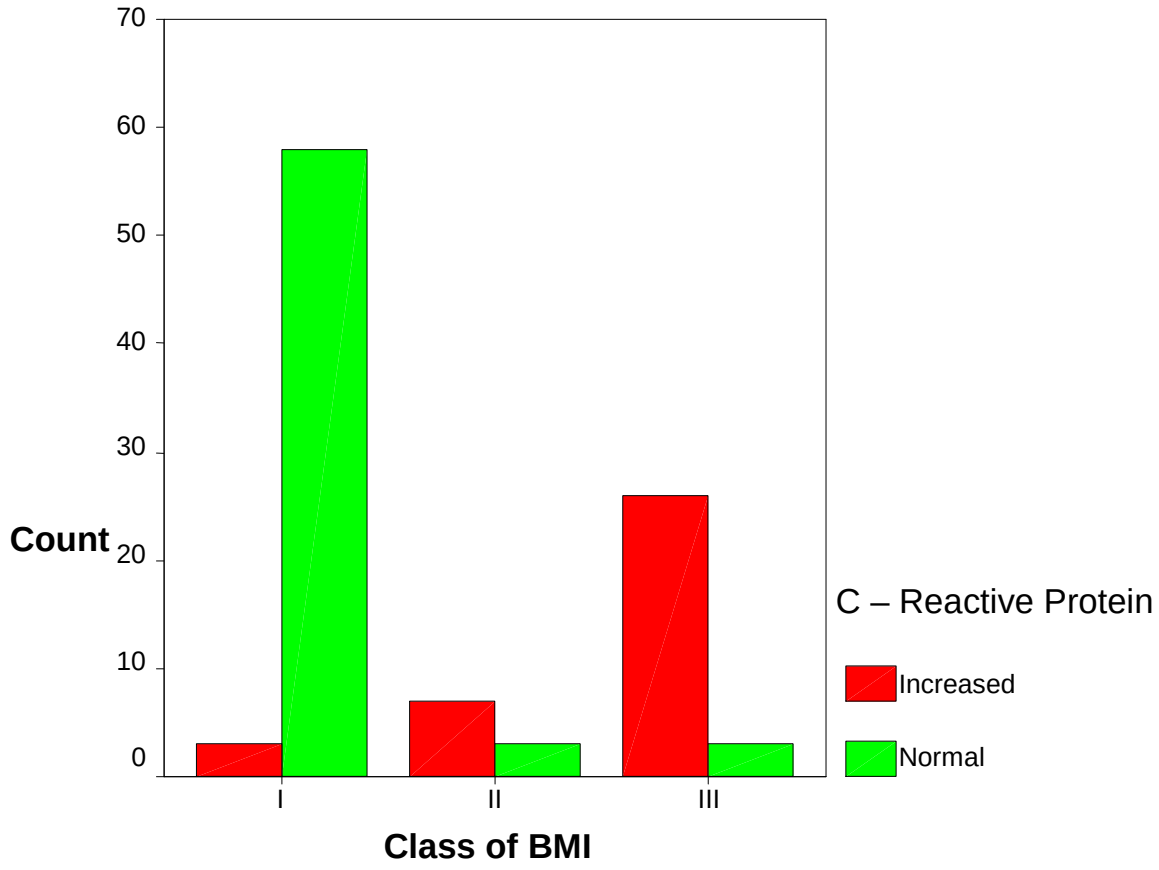
TABLE 13

CORRELATION BETWEEN C-REACTIVE PROTEIN & BMI

CLASS OF BMI		C – REACTIVE PROTEIN (mg/L)		TOTAL
		Increased	Normal	
I	Count	3	58	61
	% within Class of BMI	4.9%	95.1%	100.0%
	% within C – Reactive Protein (mg/L)	8.3%	90.6%	61.0%
II	Count	7	3	10
	% within Class of BMI	70.0%	30.0%	100.0%
	% within C – Reactive Protein (mg/L)	19.4%	4.7%	10.0%
III	Count	26	3	29
	% within Class of BMI	89.7%	10.3%	100.0%
	% within C – Reactive Protein (mg/L)	72.2%	4.7%	29.0%
	Total	36	64	100

CHART-11

CORRELATION BETWEEN C-REACTIVE PROTEIN & BMI



In this study, out of 100 patients 36 patients had elevated C-reactive protein. Among this majority came under BMI Class III (72%). Chi square test showed significant (p=<0.001) correlation between the two variables. It implies that with increasing BMI, there is increase in C-reactive protein also.

TABLE-14

MORBIDITY AND SEVERITY OF BRONCHIAL ASTHMA

S.No	MORBIDITY	SEVERITY OF ASTHMA				BMI		
		I	II	III	IV	I	II	III
1	Previous life threatening event	0	0	2	4	1	1	4
2	Missed working days	0	1	6	11	3	3	12

In our study, patients with previous life threatening event and missed working days came under asthma severity class IV and BMI class III.

RESULTS AND SUMMARY

- In this study 100 known asthmatic patients studied who were confirmed with reversibility spirometry test.

- Out of 100 patients 42 were male and 58 were female. Sex ratio was 1:1.4

- In this study, 20-40 years age group adult patients were included for study. In this most of them were between 20-25 years of age.

- Out of 100 patients, 61 patients were under BMI class I, 10 patients under BMI class II, and 29 patients under BMI class III. Majority of obese (BMI class III) were female.

- Out of 100 patients, 17 were under asthma severity class I, 39 under severity class II, 24 were under severity class III and 20 were under severity class IV.

- In this study, no significant relationship was found between age and severity of asthma.

- In our study, sex had significant correlation with severity of asthma. Majority of female patients came under the asthma severity class IV.

- Majority of house wife and agricultural workers had asthma. Significant relationship was found between occupation and severity of asthma.

- In this study, majority of patients with asthma severity class III & IV had low oxygen saturation than class I & II.

- Out of 100 patients, the majority of patients with asthma severity class IV & III had low FEV1/FVC ratio.

- In our study, majority of patients with BMI class III had increased C-reactive protein. There is significant relationship present between BMI and C-reactive protein. It implies that obesity is a pro-inflammatory condition.

- In our study, patients with BMI class III and asthma severity class IV had increased morbidity by decreasing working days and increasing life threatening events when compared with other classes.

- In our study, out of 100 patients majority of patients with BMI class III had severe persistent (class IV) asthma. It showed the significant correlation between obesity and bronchial asthma.

DISCUSSION

Approximately 65% of adults in worldwide aged 20 or above are either overweight or obese. This indicates 10% increase of obesity prevalence from previous decades of life. The national health & nutrition examination survey III estimated the adult obesity prevalence to be 18% to 23% by recent data. The behavioral risk factor surveillance system estimated the prevalence of obesity to be 20%.

Similar to the obesity epidemics, there is also increased prevalence of asthma. Obesity and asthma are major health problem worldwide. Due to the concurrent increase in asthma and obesity prevalence, many studies have reported that there is association between obesity and higher asthma prevalence. This association shows that obesity is a risk factor for asthma which was strengthened by many meta-analysis studies.

Obesity is also associated with bronchial hyper responsiveness. Finally a number of studies showed weight loss can improve both the physiological and clinical improvement of asthma.

Akerman et al, explained that there is increased risk of asthma in adults with obesity. 143 individuals were involved in this study which showed significant relation.

Saint – Pierre et al, explained that the patients with severe persistent asthma were more likely to be overweight compared to those with mild and moderate persistent asthma.

Lavoie et al, demonstrated that obese adults with asthma had poor asthma control, quality of life and use the long acting beta 2 agonists.

Camargo et al, found that the BMI, as measured in 1991, strongly correlated with the risk of development of adult onset of asthma in the following 4 years.

In our study, 100 known asthmatic patients between 20-40 years age group, confirmed with reversibility spirometry test were studied. Among this 42 were male and 58 were female. In this majority of patients were in BMI class I and majority of female patients were under BMI class III. Obese patients (BMI class III) significantly related with severe persistent and moderate persistent asthma (asthma severity class IV & III). The majority of patients in class IV severity of asthma had low FEV1/FVC ratio and low SpO2 levels than

other groups. Class IV asthma severity patients and BMI class III patients had more morbidity by decreasing working days and precipitating life threatening events than others.

Chen et al, showed that obesity is more strongly associated with non allergic asthma than allergic asthma. The non allergic asthma is more prevalent in women than men.

In our study, the female group was significantly related with class IV asthma severity. Majority of female patients were under BMI class III.

Delgado et al, revealed that obesity is a pro-inflammatory condition in which C-reactive protein and other inflammatory mediators are raised.

In our study, there is significant raise of C-reactive protein with majority of obese individuals.

LIMITATIONS OF STUDY

- Small study group is involved.

- Duration of study is short.

- In asthma patients, weight may be increased with treatment like steroids, which could not be excluded in this study.

- Asthma is a multi factorial disease. All the factors could not be measured in this study.

CONCLUSION

Obesity is a major burden in asthmatics. It increases the morbidity in asthmatic patients by decreasing working days and precipitating life threatening events. Obesity decreases oxygen saturation, FVC and FEV1/FVC ratio in asthmatic patients.

Obese female are particularly at increased risk of worsening symptoms of asthma. Obesity is a pro-inflammatory condition, which releases inflammatory mediators like C-reactive protein. Finally, obesity and overweight are significantly related with severity of asthma which increases the frequency of symptoms and life threatening events.

As obesity and asthma have considerable impact on public health, the first and foremost, weight control programme must be included in treatment plan of the obese asthmatic patients with other measures.

INTRODUCTION

AIMS & OBJECTIVES

REVIEW OF LITERATURE

MATERIALS

AND

METHODS

OBSERVATION

SUMMARY AND RESULTS

DISCUSSION

LIMITATIONS

OF THE STUDY

CONCLUSION

BIBLIOGRAPHY

ANNEXURE

INSTITUTIONAL ETHICS COMMITTEE
MADRAS MEDICAL COLLEGE, CHENNAI -3

Telephone No : 044 25305301
Fax : 044 25363970
EC RegNo.ECR/270/Inst./TN/2013

CERTIFICATE OF APPROVAL

To
Dr.P.Raja,
General Medicine MD PG,
Madras Medical College, Chennai-3.

Dear P.Raja,

The Institutional Ethics committee of Madras Medical College, reviewed and discussed your application for approval of the proposal entitled "Assesment of clinical correlation between BMI and Severity of Branched Asthma" No.11062013.

The following members of Ethics Committee were present in the meeting held on 11.06.2013 conducted at Madras Medical College, Chennai -3.

1. Dr.SivaKumar, MS FICS FAIS --- Chairperson
2. Prof. R. Nandhini MD -- Member Secretary
   Director, Instt. of Pharmacology ,MMC, Ch-3
3. Prof. Shyamraj MD -- Member
   Director i/c , Instt. of Biochemistry , MMC, Ch-3
4. Prof. P. Karkuzhali. MD -- Member
   Prof., Instt. of Pathology, MMC, Ch-3
5. Prof. A. Radhakrishnan MD -- Member
   Prof of Internal Medicine, MMC, Ch-3
6. Prof. S. Deivanayagam MS -- Member
   Prof of Surgery, MMC, Ch-3
7. Thiru. S. Govindsamy. BABL -- Lawyer
8. Tmt. Arnold Saulina MA MSW -- Social Scientist

We approve the proposal to be conducted in its presented form.

Sd/ Chairman & Other Members

The Institutional Ethics Committee expects to be informed about the progress of the study, and SAE occurring in the course of the study, any changes in the protocol and patients information / informed consent and asks to be provided a copy of the final report.

R Nadini 2/7/13
Member Secretary, Ethics Committee

INFORMATION TO THE PARTICIPANTS

Title: Assessment of Clinical correlation between BMI and Severity of Bronchial Asthma

Principal Investigator : **Dr.P.RAJA**

Name of Participant :

Site : **Department of Medicine and Department of Thoracic Medicine**
Rajiv Gandhi Government General Hospital, Madras Medical College, Chennai- 600 003.

You are invited to take part in this research. The information in this document is meant to help you decide whether or not to take part. Please feel free to ask if you have any queries or concerns.

Bronchial Asthma is a common disorder in community, characterized by Wheeze. It usually present as Breathlessness. These symptoms may last or persist for more than a day in obesity patient. So we like to assess the correlation between the BMI and severity of Bronchial Asthma.

We have obtained permission from the Institutional Ethics Committee.

All patients in the study will be divided in to 2 groups. You will be assigned to either of the groups.

You will be subjected to history, physical examination and pulmonary functions test to assess severity.

Blood (10 ml) will be taken for checking your urea, cretinine, Blood Sugar, Lipid Profile, CBC and Thyroid profile.

- Pulmonary function test for Asses the Stage of Bronchial Asthma
- All the above investigation will be done only once.
- You will not be charged for the above investigation
- There is no risk to your health, if you decide to participate in this study.

The result of the study may provide benefits to the society in terms of advancement of medical knowledge and benefits to the future patients.

You have the right to confidentiality regarding the privacy of your medical information.

By signing this document, you will be allowing the research team investigators, other study personnel, Institutional Ethical Committee, to view your Data, if required. The information from this study, If published in scientific Journals or presented at scientific meeting, will not reveal your identity.

Your decision not to participate in this research study, will not affect your medical care or your relationship with the investigator or the institution. You will be taken care and you will not loose any benefits to which you are entitled.

The participation in this research is purely voluntary and you have the right to withdraw from this study at any time during the course of the study without giving any reasons. However, it is advisable that you talk to the research team prior to withdrawal.

Signature of Investigator ***Signature of Participant***

ஆய்வு பற்றிய தகவல் அறிக்கை

ஆய்வின் தலைப்பு : **உடல் பருமன் அதிகரிப்பதால் ஆஸ்துமாவின் வீரியதன்மை அதிகரிக்கிறதா? என்பதை அறிதல்**

ஆய்வாளர் பெயர் : **மரு. ராஜா**

ஆய்வில் பங்கேற்பவர் பெயர் :

இடம் : பொது மருத்துவதுறை மற்றும்
நுரையீரல் நோய் மருத்துவத்துறை
ராஜீவ்காந்தி அரசு பொது மருத்துவமனை,
சென்னை மருத்துவக் கல்லூரி,
சென்னை-03

இந்த ஆய்வில் பங்கேற்க உங்களை வரவேற்கிறேன். இந்த ஆய்வின் முழுவிவரங்களை இங்கே விவரித்துள்ளேன். இது பற்றிய எந்த சந்தேகம் இருந்தாலும் எந்த சமயத்திலும் கேட்க தவறவேண்டாம்.

ஆஸ்துமா என்பது சமுதாயத்தில் முக்கியவியாதி. இதன் முக்கிய அறிகுறி இளைப்பு (Wheezing) உடல் பருமன் அதிகமாக உள்ளவர்களுக்கு இந்த இளைப்பு வியாதி ஓரிரு நாட்களிலோ அல்லது அதிகான நாட்களிலோ சரியாகலாம்.

ஆகையால், உடல் பருமன் அதிகரிப்பதால் இளைப்பு வியாதியின் வீரியம் அதிகரிக்கிறதா? என்பது பற்றி அறிய வேண்டி உள்ளது.

நிலைய ஆய்வு குழுவிடம் இருந்து இதற்கு ஒப்புதல் பெறப்பட்டுள்ளது.

இந்த ஆய்வில் பங்குபெறுபவர்கள் அனைவரும் இருபிரிவுகளாக பிரிக்கப்பட்டு, ஏதாவது ஒரு பிரிவில் நீங்கள் இடம் பெறுவீர்கள்.

உங்களின் நோயின்தன்மைபற்றி கேள்விகள் கேட்கபடும், அதன்பின்பு நுரையீரல் திறன் சோதனை (Pulmonary Function Test) செய்யப்படும்.

இரத்த பரிசோதனைகளுக்கு (CBC, RFT, LFT, TFT, Blood Sugar) 10 மிலி இரத்தம் உங்களிடம் இருந்து எடுக்கப்படும்.

மேலே கூறிய அனைத்து பரிசோதனைகளும் ஒரே ஒருமுறைதான் செய்யப்படும். இதற்காக பணம் செலுத்த தேவையில்லை.

இந்த ஆய்வு மருத்துவ உலகத்திற்கும், சமுதாயத்திற்கும் பயனுள்ளதாக இருக்கும்.

உங்களை பற்றிய எந்த தகவலையும் உங்களுக்கு தெரியாமல் வெளிவிடமாட்டோம். இதுபற்றி விவரங்கள் நீங்கள் எப்போது தெரிந்து கொள்ள ஆசைப்பட்டாலும் உங்களுக்கு தெரியப்படுத்தப்படும்.

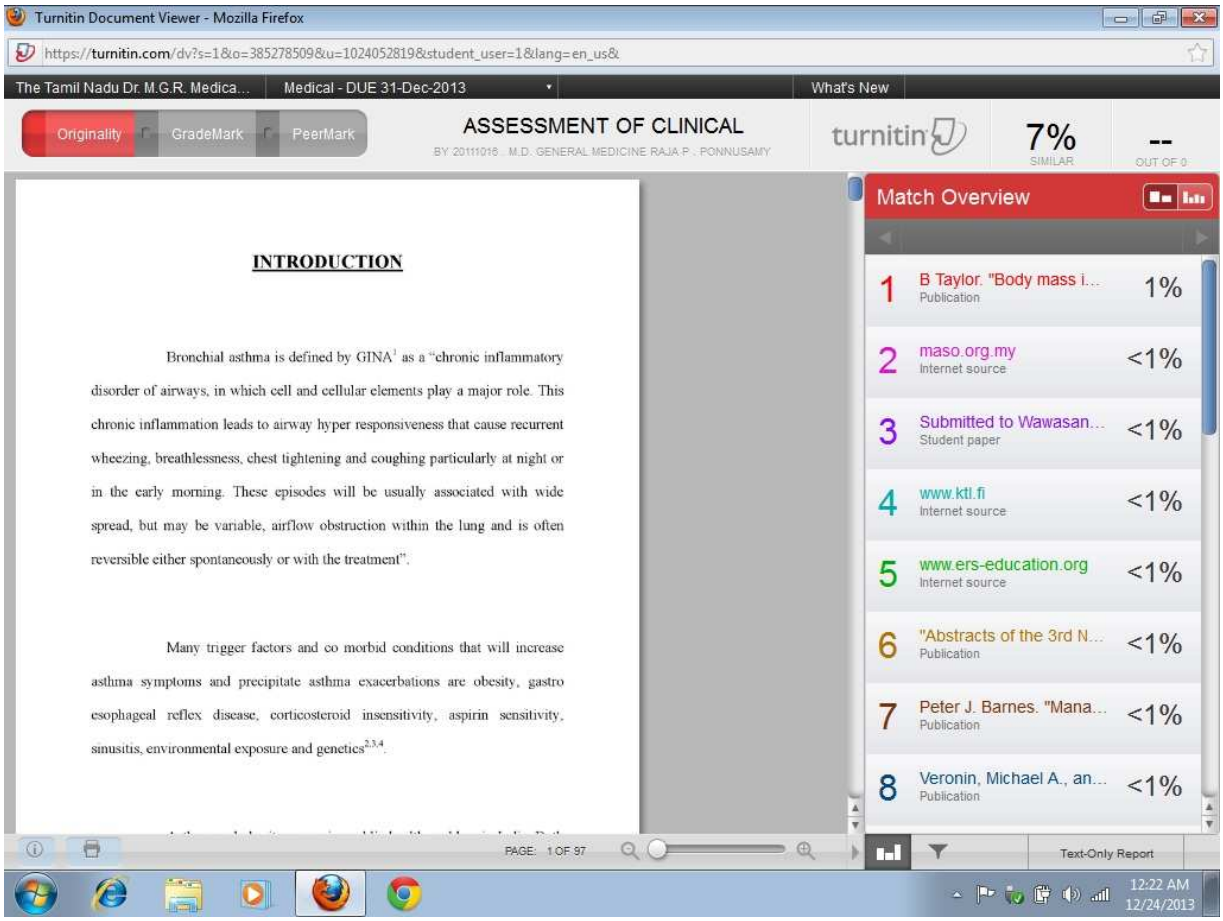
இந்த ஆய்வின் விளைவுகளை மருத்துவ ஆய்வு புத்தகங்களில் வெளியிடப்படும். உங்களை பற்றிய விவரங்கள் இதன் இடம் பெறாது.

இந்த ஆய்வில் இடம் பெறாவிட்டாலும், உங்களுக்கான மருத்துவ கவனிப்பில் எவ்வித மாற்றமும் இருக்காது.

இந்த ஆய்விற்க்கு தன்னார்வமுடையவர்களாக இருக்க வேண்டும். எப்போது வேண்டுமானாலும் இந்த ஆய்வில் இருந்து விலகி கொள்ள உரிமை உண்டு, ஆனால் விலகும் முன்பு ஆய்வாளரிடம் தெரிவிக்க வேண்டும்.

ஆய்வாளரின் கையொப்பம் **ஆய்வில் பங்கேற்பாளர் கையொப்பம்**

நாள்: **நாள்:**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INTRODUCTION
Bronchial asthma is defined by GINA[1] as a "chronic inflammatory disorder of airways, in which cell and cellular elements play a major role. This chronic inflammation leads to airway hyper responsiveness that cause recurrent wheezing, breathlessness, chest tightening and coughing particularly at night or in the early morning. These episodes will be usually associated with wide spread, but may be variable, airflow obstruction within the lung and is often reversible either spontaneously or with the treatment".
Many trigger factors and co morbid conditions that will increase asthma symptoms and precipitate asthma exacerbations are obesity, gastro esophageal reflex disease, corticosteroid insensitivity, aspirin sensitivity, sinusitis, environmental exposure and genetics[2,3,4].
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INTRODUCTION Bronchial asthma is defined by GINA1 as a "chronic inflammatory disorder of airways, in which cell and cellular elements play a major role. This chronic inflammation leads to airway hyper responsiveness that cause recurrent wheezing, breathlessness, chest tightening and coughing particularly at night or in the early morning. These episodes will be usually associated with wide spread, but may be variable, airflow obstruction within the lung and is often reversible either spontaneously or with the treatment". Many trigger factors and co morbid conditions that will increase asthma symptoms and precipitate asthma exacerbations are obesity, gastro esophageal reflex disease,...

PROFORMA

Name	:	Body weight	:
Age / sex	:	Height	:
IP / OP No	:	BMI	:
Occupation	:		
Address	:		
Contact No	:		

COMPLAINTS:

Cold ☐ Sneezing ☐ Cough ☐ Snoring during sleep ☐

Wheeze ☐ _____episode/month _____episode/year

Wheeze without breathlessness ☐ _____episode/month _____episode/year

Night time wheeze ☐ > 1 per week < 1 per week absent

Symptoms of waking ☐ > 1 per week < 1 per week absent

Admission or emergency unit_____ / month _____ / year

Previous life threatening attack Present / Absent _____ times

Missed work days ☐

PAST HISTORY:

DM ☐ CAD ☐ SHT ☐ TB ☐

Epilepsy ☐ Hypothyroidism ☐ COPD ☐

Bronchial asthma ☐ _____ years

TREATMENT HISTORY:

Short acting beta 2 agonist – any use

Short acting beta 2 agonist – daily use

Long acting beta 2 agonis

Anticholinergics

Methylxanthine

Leukotriene antagonists

Cromolyn

Inhaled corticosteroids

Oral corticosteroids

PERSONAL HISTORY:

Smoker

Alcoholic

FAMILY HISTORY:

Consanguinous marriage

Similar history to _____

GENERAL EXAMINATION:

VITALS:

Systemic examination:

Respiratory system:

Upper respiratory tract

Lower respiratory tract

Cardio-vascular system:

Per abdomen:

Central nervous system:

Investigations:

CBC:		Thyroid Function Test:
RFT:		C-reactive protein:
LFT:		Chest X-ray:
ECG:	SpO2:	Pulmonary function test:

வினா தொகுப்பு

பெயர் : எடை :

வயது / பாலினம் : உயரம் :

உள்/வெளி நோயாளி எண் : உடல்பருமன்விகிதம் (BMI) :

தொழில் : தொடர்பு எண் :

முகவரி :

1. அ. நீங்கள் ஆஸ்துமாவினால் பாதிக்கப்படுபவரா?

ஆம் ☐ இல்லை ☐

ஆ. ஆம் எனில், இளைப்பு (Wheezing) ஒரு வாரத்திற்கு எத்தனை முறை? _____

ஒரு மாதத்திற்கு எத்தனை முறை? _____

2. அ. இரவு நேரங்களில் உறங்கும்போது இளைப்பினால் (Wheezing) பாதிக்கப்பட்டிருக்கிறீர்களா?

ஆம் ☐ இல்லை ☐

ஆ. ஆம் எனில், ஒரு வாரத்திற்கு எத்தனை முறை? _____

ஒரு மாதத்திற்கு எத்தனை முறை? _____

3. அ. இளைப்பினால் (Wheezing) அவசர பிரிவு உதவியை அணுகியுள்ளீகளா?

ஆம் ☐ இல்லை ☐

ஆ. ஆம் எனில், ஒரு மாதத்திற்கு எத்தனை முறை? _____

4. அ. இளைப்பினால் (Wheezing) உயிருக்கு ஆபத்தான நிலையில் மருத்துவமனையில் அனுமதிக்கப்பட்டுள்ளீர்களா?

ஆம் ☐ இல்லை ☐

ஆ. ஆம் எனில், ஒரு வருடத்தில் எத்தனை முறை? _____

5. அ. இளைப்பினால் (Wheezing) உங்கள் தினசரி நடவடிக்கைகளில் தொய்வு ஏற்பட்டுள்ளதா?

ஆம் ☐ இல்லை ☐

6. அ. இளைப்பினால் (Wheezing) உங்கள் அலுவலக வேலைகளில் இருந்து விடுப்பு எடுத்துள்ளீர்களா?

ஆம் ☐ இல்லை ☐

ஆ. ஆம் எனில், ஒரு வருடத்தில் எத்தனை நாட்கள்? _____

7. அ. நீங்கள் இளைப்பிற்காக (Wheezing) Inhaler/Spacer/Rotahaluer/ Nebulizer உபோகிப்பவரா?

ஆம் ☐ இல்லை ☐

ஆ. ஆம் எனில், குறிப்பிடுக? _____

8. அ. உங்கள் குடும்பத்தில் யாராவது ஆஸ்துமாவினால் பாதிக்கப்பட்டுள்ளார்களா?

ஆம் ☐ இல்லை ☐

ஆ. ஆம் எனில், உறவு முறை? _____

PATIENT CONSENT FORM

Study Title : **‘’ASSESSMENT OF CLINICAL CORRELATION BETWEEN BODY MASS INDEX AND SEVERITY OF BRONCHIAL ASTHMA”**

Study Centre : Institute of Internal Medicine & Department of Thoracic Medicine, Rajiv Gandhi Government General Hospital, Chennai.

Patient’s Name :

Patient’s Age :

Identification Number :

Patient may check (□) these boxes

I confirm that I have understood the purpose of procedure for the above study. I have the opportunity to ask question and all my questions and doubts have been answered to my complete satisfaction. ❑

I understand that my participation in the study is voluntary and that I am free to withdraw at any time without giving reason, without my legal rights being affected. ❑

I understand that sponsor of the clinical study, others working on the sponsor’s behalf, the ethical committee and the regulatory authorities ❑

will not need my permission to look at my health records, both in respect of current study and any further research that may be conducted in relation to it, even if I withdraw from the study I agree to this access. However, I understand that my identity will not be revealed in any information released to third parties or published, unless as required under the law. I agree not to restrict the use of any data or results that arise from this study.

I agree to take part in the above study and to comply with the instructions given during the study and faithfully cooperate with the study team and to immediately inform the study staff if I suffer from any deterioration in my health or well being or any unexpected or unusual symptoms.

❑

I hereby consent to participate in this study.

❑

I hereby give permission to undergo complete clinical examination , biochemical, immunological test. ❑

Signature/thumb impression

Patient’s Name and Address:

Signature of Investigator

Study Investigator’s Name: **Dr. P. RAJA**

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MASTER CHART

S.NO	AGE	SEX	OCCUPATION	BMI	CLASS OF BMI	C – REACTIVE PROTEIN(mg/L)	PREVIOUS LIFE THREATENING EVENT	MISSED WORKING DAYS	HISTORY									PULMONARY FUNCTION TEST								SEVERITY CLASS OF ASTHMA
									DAY TIME SYMPTOMS				NIGHT TIME SYMPTOMS						FEV 1			PEFR				
									< 1 TIME / WEELK	> 1 TIME / WEEK	DAILY	CONTINUOUS	<2 TIMES /	>2 TIMES /	>1 TIME / WEEK	FREQUENT	Spo2 %	FEV 1/FVC	ACTUAL	PREDICTED	% PREDICTED`	ACTUAL	PREDICTED	% PREDICTED	% VARIABILITY	
1	25	F	HW	22	I	4	-	-	-	+	-	-	+	-	-	-	98	0.7	1.86	1.68	90.32	8.14	7.78	95.58	14	II
2	40	M	AW	27	III	18	-	-	-	-	+	-	-	-	+	-	95	0.5	1.45	2.33	96.28	5.85	3.20	54.70	33	III
3	38	F	HW	26	III	22	-	+	-	-	-	-	-	-	+	-	94	0.58	1.76	0.82	46.59	6.46	3.33	51.55	22	III
4	32	F	HW	19	I	2	-	-	-	+	-	-	+	-	-	-	98	0.78	2.01	1.43	71.14	5.74	5.60	97.56	24	II
5	32	M	AW	22	I	11	+	-	-	-	+	-	-	-	-	-	94	0.6	1.66	1.56	93.98	5.10	5.50	107	38	III
6	40	F	HW	19	I	4	-	-	-	+	-	-	+	-	-	-	95	0.86	3.32	3.17	95.48	3.40	3.40	100	24	II
7	30	M	AW	19	I	2	-	-	+	-	-	-	+	-	-	-	96	0.88	1.90	1.75	92.10	3.00	2.50	83.00	16	I
8	39	M	AW	24	II	11	-	+	-	-	-	+	-	-	-	+	94	0.48	1.90	1.77	93.15	8.42	7.89	93.70	36	IV
9	40	F	HW	23	II	18	-	-	-	-	+	-	-	-	+	-	95	0.68	1.57	1.20	76.40	6.77	6.07	99.00	31	III
10	23	F	HW	20	I	5	-	-	-	+	-	-	-	-	-	-	96	0.80	1.77	1.15	64.90	5.77	5.80	101.00	22	II
11	40	F	OW	29	III	9	-	-	-	+	-	-	-	-	+	-	94	0.57	1.65	1.29	78.18	6.36	6.45	64.80	22	III
12	27	M	AW	28	III	22	-	-	-	-	+	-	-	-	-	-	93	0.45	2.58	0.70	27.17	8.11	8.23	101.00	23	IV
13	40	F	HW	30	III	26	+	-	-	-	+	-	-	-	-	+	94	0.50	2.43	1.30	53.50	2.80	3.06	50.16	33	IV

14	40	M	AW	22	I	4	-	-	+	-	-	-	+	-	-	-	98	0.88	2.61	2.50	95.79	2.80	3.06	55.50	12	I
15	23	F	HW	19	I	6	-	-	-	+	-	-	-	+	-	-	98	0.86	1.88	0.97	50.00	8.70	5.98	68.80	26	II
16	40	M	AW	32	III	18	-	-	-	-	+	-	-	-	-	+	93	0.48	1.52	1.10	90.00	9.02	9.00	99.78	22	IV
17	25	M	AW	21	I	3	-	-	+	-	-	-	+	-	-	-	97	0.90	2.94	2.00	92.00	5.87	6.00	101.00	12	I
18	28	F	HW	22	I	5	-	-	-	+	-	-	-	+	-	-	96	0.78	1.80	1.56	94.00	3.33	4.05	105.00	24	II
19	25	M	OW	20	I	5	-	-	-	+	-	-	-	+	-	-	96	0.75	2.30	1.36	82.00	5.63	5.50	97.60	23	II
20	38	F	OW	29	III	24	+	-	-	-	-	+	-	-	-	-	94	0.52	1.69	1.55	91.00	8.16	3.33	40.00	38	IV
21	36	F	HW	30	III	20	-	-	-	-	+	-	-	-	+	-	94	0.45	1.61	1.50	93.00	7.35	4.30	38.00	35	IV
22	24	F	HW	24	II	8	-	-	-	+	-	-	-	+	-	-	98	0.78	1.48	1.30	89.00	6.96	7.02	108.00	18	II
23	25	M	AW	19	I	3	-	-	-	+	-	-	-	-	-	-	97	0.70	1.88	0.90	47.80	5.49	2.78	52.00	24	II
24	37	F	HW	26	III	8	-	-	-	+	-	-	-	+	-	-	98	0.78	1.41	1.38	99.00	6.30	3.79	60.16	28	II
25	27	M	AW	23	II	12	-	+	-	-	+	-	-	-	+	-	95	0.65	3.03	2.10	56.40	4.97	5.50	110.00	32	III
26	40	M	AW	30	III	14	-	-	-	+	-	-	-	+	-	-	97	0.78	2.22	1.24	55.80	5.10	5.50	80.00	22	II
27	33	M	AW	21	I	3	-	-	+	-	-	-	-	-	-	-	97	0.80	1.84	1.53	83.00	9.02	9.00	98.78	24	I
28	39	F	HW	26	III	11	+	+	-	-	-	+	-	-	-	+	93	0.45	1.63	1.53	89.00	5.87	6.66	69.82	34	IV
29	37	F	HW	21	I	5	-	-	-	+	-	-	-	+	-	-	96	0.78	2.73	2.09	76.56	4.50	3.33	68.18	22	II
30	22	M	AW	19	I	2	-	-	+	-	-	-	+	-	-	-	97	0.82	3.01	3.14	101	5.63	5.50	97.60	12	I
31	23	F	HW	21	I	5	-	-	-	+	-	-	-	+	-	-	96	0.75	1.67	1.50	89.82	9.16	5.33	56.00	23	II
32	40	M	AW	19	I	6	-	-	+	-	-	-	-	-	-	-	97	0.88	2.06	1.74	84.00	4.97	4.00	90.00	18	I
33	40	F	HW	30	III	16	-	-	-	+	-	-	-	+	-	-	95	0.70	2.12	2.00	96.00	6.30	3.79	60.16	23	II
34	30	F	HW	21	I	4	-	-	-	+	-	-	-	+	-	-	96	0.78	1.87	1.45	61.08	8.70	5.98	68.00	26	II
35	38	F	HW	28	III	14	-	+	-	-	-	+	-	-	-	+	94	0.42	1.64	1.02	61.08	6.96	7.02	100.80	44	IV
36	28	F	AW	26	III	24	-	-	-	-	-	+	-	-	-	+	93	0.45	2.28	2.18	98.00	7.35	4.30	58.50	33	IV
37	21	F	AW	22	I	8	-	-	-	+	-	-	-	-	-	-	98	0.76	2.01	1.35	67.15	8.71	5.98	70.50	22	II
38	38	M	AW	19	I	6	-	-	-	-	-	-	+	-	-	-	96	0.70	2.75	1.82	70.18	3.06	2.80	98.00	24	II
39	23	M	AD	20	I	2	-	-	+	-	-	-	+	-	-	-	98	0.82	2.03	1.48	72.00	8.07	8.25	102.00	16	I
40	36	F	HW	23	II	11	-	-	+	-	-	-	+	-	-	-	98	0.85	2.47	2.38	95.00	8.11	8.23	101.40	12	I

41	25	F	OW	19	I	9	-	-	-	-	+	-	-	+	-	-	94	0.52	1.65	1.50	90.91	6.24	6.10	97.76	28	III
42	32	F	OW	27	III	14	+	+	-	-	-	+	-	+	-	-	93	0.55	1.41	1.55	106	5.84	5.78	99.66	27	IV
43	23	F	HW	21	I	4	-	-	-	+	-	-	-	+	-	-	95	0.70	2.35	2.75	110	4.92	4.90	99.59	22	II
44	25	F	HW	21	I	5	-	-	-	-	-	-	-	+	-	-	97	0.76	1.40	1.37	97.80	7.95	7.50	94.34	11	II
45	23	M	AW	19	I	11	-	+	-	-	+	-	-	-	-	-	95	0.68	1.23	1.03	84.00	3.01	2.50	83.06	23	III
46	40	M	AW	24	II	9	-	-	+	-	-	-	-	-	-	-	98	0.82	2.59	2.50	96.00	3.21	2.62	85.00	18	I
47	22	F	HW	21	I	4	-	-	-	-	+	-	-	-	-	-	94	0.66	2.11	1.84	87.20	8.42	7.80	93.70	32	III
48	39	F	HW	27	III	12	-	+	-	-	+	-	-	-	+	-	95	0.55	1.76	1.46	82.90	6.77	6.87	101	37	III
49	35	M	AW	19	I	6	-	-	+	-	-	-	-	-	-	-	98	0.84	1.98	2.06	104	5.77	5.80	100	9	I
50	38	M	AW	27	III	18	-	-	-	-	+	-	-	-	+	-	94	056	2.40	2.17	90.00	6.36	6.45	101	32	III
51	20	M	AD	21	I	5	-	-	-	+	-	-	-	+	-	-	96	0.74	1.40	1.54	110	5.74	5.60	85.00	26	II
52	22	F	HM	19	I	7	-	+	-	-	+	-	-	-	-	-	94	0.68	3.69	3.60	97.50	6.46	3.33	51.55	22	III
53	32	M	AW	24	II	11	-	-	-	-	+	-	-	-	+	-	95	0.56	1.63	0.61	40.00	5.80	3.20	38.88	30	III
54	22	M	AD	20	I	6	-	-	-	-	-	+	-	-	-	+	93	0.48	3.32	3.17	95.40	8.14	7.78	95.50	37	IV
55	39	F	HM	22	I	3	-	-	-	+	-	-	-	+	-	-	96	0.80	1.90	1.75	92.00	6.24	6.10	97.70	22	II
56	35	M	AW	22	I	3	-	-	-	+	-	-	-	+	-	-	98	0.76	1.96	1.77	93.00	5.80	5.78	99.66	27	II
57	38	F	HW	24	II	12	-	-	-	+	-	-	+	-	-	-	96	0.70	1.57	1.20	76.43	4.92	4.90	99.50	18	II
58	36	F	HW	19	I	7	-	+	-	-	+	-	-	-	+	-	95	0.66	1.77	1.15	64.90	7.95	7.50	98.34	28	III
59	23	M	AW	21	I	4	-	+	-	-	+	-	-	-	-	-	97	0.76	1.65	1.29	78.00	3.41	3.40	100	22	II
60	38	F	HW	25	III	13	-	-	-	-	+	-	-	-	+	-	93	0.56	2.58	0.90	30.00	3.01	2.50	83.06	45	IV
61	33	M	CW	19	I	2	-	-	-	+	-	-	-	+	-	-	98	0.76	2.40	1.70	68.00	5.49	2.78	50.64	22	II
62	22	F	HW	19	I	2	-	-	+	-	-	-	-	-	-	-	98	0.84	3.66	2.94	92.00	3.40	3.40	100	12	I
63	39	M	AW	20	I	7	-	-	-	+	-	-	-	+	-	-	95	0.76	1.52	1.60	105	3.01	2.50	83.06	24	II
64	34	F	HW	21	I	6	-	-	-	+	-	-	-	+	-	-	96	0.70	1.66	1.56	93.58	8.42	7.89	93.70	23	II
65	33	F	HW	26	III	16	-	-	-	-	-	+	+	-	-	-	94	0.50	2.01	1.43	71.00	6.77	6.80	101	33	IV
66	20	M	S	19	I	3	-	-	+	-	-	-	-	-	-	-	96	0.84	2.43	1.30	53.50	8.42	7.89	93.70	14	I
67	28	F	HW	27	III	15	+	+	-	-	-	+	-	-	-	-	94	0.52	2.61	2.50	95.70	6.77	6.87	101	24	IV

68	30	F	HW	21	I	5	-	-	-	+	-	-	-	+	-	-	96	0.78	1.60	1.50	93.00	6.36	6.45	101	16	II
69	34	M	AW	19	I	7	-	-	-	-	+	-	-	-	+	-	95	0.68	1.48	1.30	87.80	8.07	8.25	102	22	III
70	40	F	HW	22	I	3	-	-	-	+	-	-	-	+	-	-	96	0.72	1.88	0.90	47.80	8.11	8.23	101	24	II
71	23	M	CW	21	I	8	-	-	-	-	+	-	-	-	+	-	95	0.66	1.41	1.40	99.20	2.80	3.06	109	28	III
72	22	F	HW	25	II	9	-	-	-	+	-	-	-	-	-	-	97	0.76	3.03	1.01	36.40	8.70	5.98	68.60	28	II
73	39	M	AW	21	I	9	-	-	-	-	+	-	-	-	+	-	94	0.60	1.69	1.55	91.7	7.35	4.30	58.5	32	III
74	40	F	HW	26	III	18	-	+	-	-	-	+	-	-	-	-	94	0.52	2.36	2.31	98.0	7.02	6.86	80.6	38	IV
75	28	F	HW	23	II	11	-	-	-	+	-	-	-	+	-	-	96	0.70	2.61	2.50	95.7	6.77	6.80	101	20	II
76	35	F	HW	21	I	4	-	-	-	+	-	-	-	-	-	-	97	0.78	2.11	1.80	87.2	6.30	3.79	60.16	22	II
77	28	F	HW	20	I	2	-	-	-	+	-	-	-	+	-	-	96	0.72	1.40	1.77	97.8	7.35	4.30	60.60	13	II
78	26	F	OW	25	III	12	-	+	-	-	+	-	-	-	-	-	95	0.64	2.35	2.75	110	8.7	5.98	68.7	28	III
79	25	M	CW	21	I	6	-	-	+	-	-	-	-	-	-	-	98	0.70	1.41	1.55	109	2.8	3.06	109	19	I
80	22	F	HW	19	I	3	-	-	-	-	+	-	-	+	-	-	94	0.56	1.65	1.50	90.9	8.07	8.25	102	45	III
81	32	F	HW	29	III	9	-	-	+	-	-	-	+	-	-	-	98	0.78	2.75	1.82	66.8	9.02	9.00	99.78	15	I
82	32	M	AW	21	I	7	-	-	-	+	-	-	-	+	-	-	95	0.66	2.01	1.35	67.18	5.10	5.50	107	25	II
83	25	M	AW	20	I	4	-	-	+	-	-	-	-	-	-	-	97	0.82	2.18	2.28	104	5.74	5.60	97.5	14	I
84	25	F	HW	19	I	6	-	-	-	-	+	-	-	-	+	-	95	0.58	1.61	1.02	61.8	6.46	3.33	51.3	30	III
85	23	M	S	22	I	2	-	-	+	-	-	-	+	-	-	-	98	0.80	1.87	1.45	77.5	5.85	3.20	54.70	16	I
86	40	F	HW	21	I	5	-	-	-	+	-	-	-	+	-	-	97	0.74	1.76	0.82	46.59	5.77	5.80	100	23	II
87	25	F	HW	30	III	15	-	+	-	-	+	-	-	-	-	+	94	0.54	2.42	2.33	96.20	6.36	6.45	101	37	IV
88	28	M	AW	20	I	3	-	-	-	+	-	-	-	+	-	-	96	0.78	1.86	1.68	90.30	8.11	8.23	101	22	II
89	22	M	AW	19	I	6	-	-	-	+	-	-	-	-	-	-	97	0.70	1.65	1.50	90.91	8.07	8.25	102	20	II
90	39	F	HW	29	III	16	+	+	-	-	-	+	-	+	-	-	94	0.54	1.41	1.31	98	2.80	3.06	109	32	IV
91	35	F	HW	20	I	8	-	-	-	-	-	+	-	-	-	-	95	0.50	2.75	2.35	98	8.71	5.98	68.7	45	IV
92	32	F	HW	28	III	25	-	-	-	-	+	-	-	-	-	-	96	0.60	1.40	1.33	97	7.35	4.30	58.5	32	III
93	22	M	S	22	I	6	-	-	-	-	+	-	-	-	+	-	96	0.68	1.23	1.03	83.7	6.96	7.00	100.8	32	III
94	27	M	AW	29	III	18	-	-	+	-	-	-	+	-	-	-	97	0.78	2.59	2.50	96.5	5.49	2.78	51.4	14	I

95	23	F	HW	21	I	5	-	-	-	-	+	-	-	-	+	-	95	0.68	2.11	1.84	87.2	6.30	3.79	60.16	25	III
96	24	M	AW	27	III	12	-	+	-	-	-	+	-	-	-	-	93	0.58	1.76	1.46	82.9	4.97	5.50	110	31	IV
97	23	F	HW	19	I	2	-	-	-	+	-	-	+	-	-	-	97	0.74	1.98	2.06	104	9.16	3.33	36.35	23	II
98	27	M	AW	22	I	4	-	-	-	+		-	-	-	-	-	97	0.80	2.40	2.17	90.42	5.63	5.50	97.6	29	II
99	25	F	HW	21	I	11	-	-	-	-	+	-	-	-	+	-	95	0.56	2.38	2.47	103	3.33	4.50	110	22	III
100	28	F	HW	30	III	16	-	+	-	-	-	+	-	-	+	-	93	0.50	2.03	1.48	90.00	5.87	6.66	113	35	IV

M – Male

F – Female

HW – Housewife

AW – agricultural worker

OW – office worker

CW – company worker

AD – Auto driver

S – Student